



This is a digital copy of a book that was preserved for generations on library shelves before it was carefully scanned by Google as part of a project to make the world's books discoverable online.

It has survived long enough for the copyright to expire and the book to enter the public domain. A public domain book is one that was never subject to copyright or whose legal copyright term has expired. Whether a book is in the public domain may vary country to country. Public domain books are our gateways to the past, representing a wealth of history, culture and knowledge that's often difficult to discover.

Marks, notations and other marginalia present in the original volume will appear in this file - a reminder of this book's long journey from the publisher to a library and finally to you.

Usage guidelines

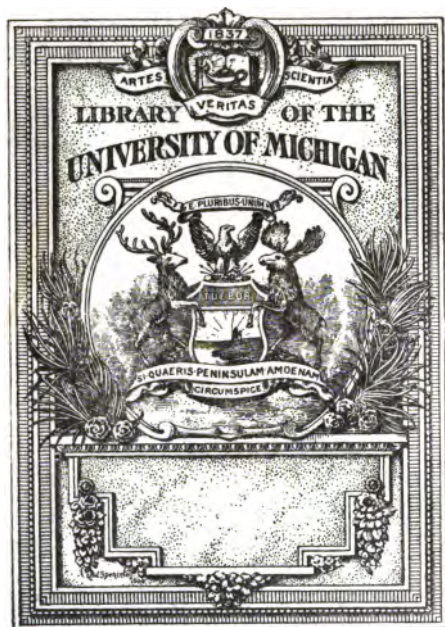
Google is proud to partner with libraries to digitize public domain materials and make them widely accessible. Public domain books belong to the public and we are merely their custodians. Nevertheless, this work is expensive, so in order to keep providing this resource, we have taken steps to prevent abuse by commercial parties, including placing technical restrictions on automated querying.

We also ask that you:

- + *Make non-commercial use of the files* We designed Google Book Search for use by individuals, and we request that you use these files for personal, non-commercial purposes.
- + *Refrain from automated querying* Do not send automated queries of any sort to Google's system: If you are conducting research on machine translation, optical character recognition or other areas where access to a large amount of text is helpful, please contact us. We encourage the use of public domain materials for these purposes and may be able to help.
- + *Maintain attribution* The Google "watermark" you see on each file is essential for informing people about this project and helping them find additional materials through Google Book Search. Please do not remove it.
- + *Keep it legal* Whatever your use, remember that you are responsible for ensuring that what you are doing is legal. Do not assume that just because we believe a book is in the public domain for users in the United States, that the work is also in the public domain for users in other countries. Whether a book is still in copyright varies from country to country, and we can't offer guidance on whether any specific use of any specific book is allowed. Please do not assume that a book's appearance in Google Book Search means it can be used in any manner anywhere in the world. Copyright infringement liability can be quite severe.

About Google Book Search

Google's mission is to organize the world's information and to make it universally accessible and useful. Google Book Search helps readers discover the world's books while helping authors and publishers reach new audiences. You can search through the full text of this book on the web at <http://books.google.com/>



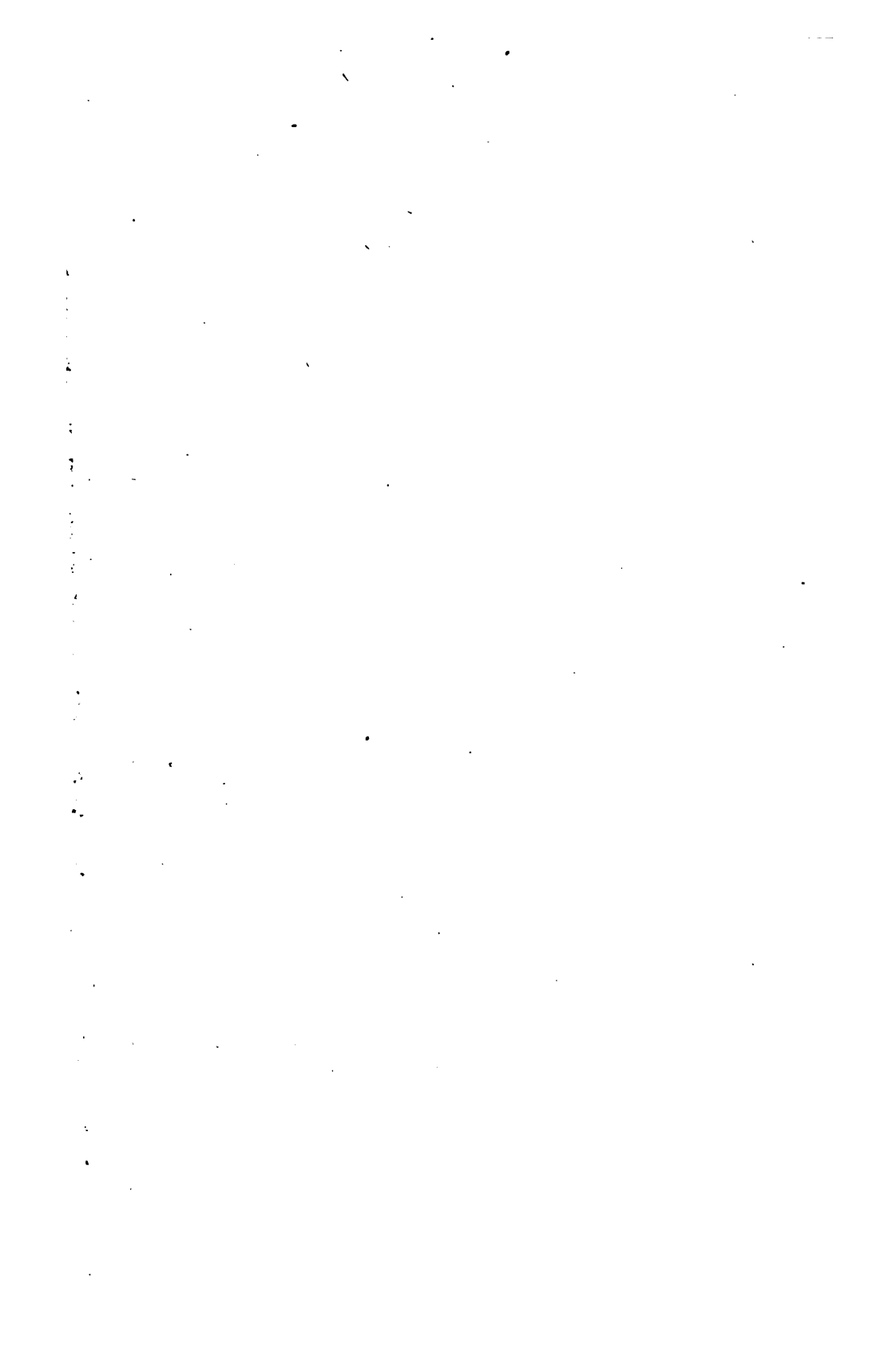
Chemical Library

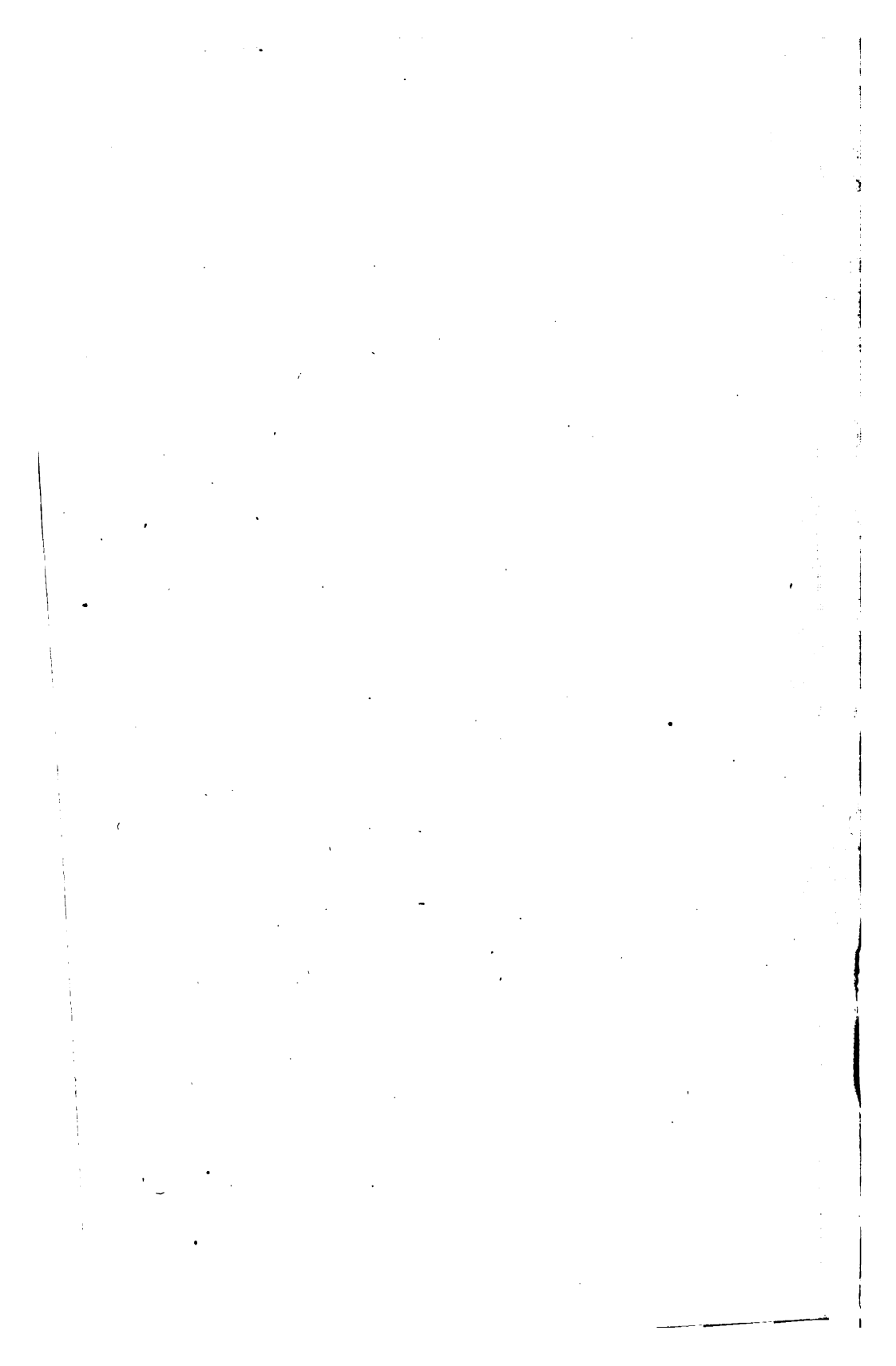
Q □

181

.F4

Ⅱ 275





PREHISTORIC
IRON AND STEEL.

"WHEN our speculations are duly fed from the spring-heads of Observation, and frequently drawn off into the region of Applied Science, we may have a living stream of consistent and progressive knowledge. That science may be both real as to its import, and logical as to its form, the examples of many existing sciences sufficiently prove.

"So long, however, as attempts are made to form sciences, without such a verification and realisation of their fundamental ideas, there is in the natural series of speculation no self-correcting principle. A philosophy constructed on notions obscure, vague, and unsubstantial, and held in spite of the want of correspondence between its doctrines and the actual train of physical events, may long subsist, and occupy men's minds. Such a philosophy must depend for its permanence upon the pleasure which men feel in tracing the operations of their own and other men's minds, and in reducing them to logical consistency and systematical arrangement.

"In these cases the main subjects of attention are not external objects, but speculations previously delivered. . . . The *opinions* of the Masters are the *facts* which the Disciples endeavour to reduce to unity, or to follow into consequences."

"*History of the Inductive Sciences*," by William Whewell, D.D.,
Master of Trinity, p. 14.



From the Author.

THE PREHISTORIC USE
OF 73831
IRON AND STEEL:

WITH
OBSERVATIONS ON CERTAIN MATTERS
ANCILLARY THERETO.

BY
ST. JOHN V. DAY, C.E.; F.R.S.E.;

Member of the Institution of Mechanical Engineers; Member of the Institution of Engineers
in Scotland; Member of the Iron and Steel Institute; Member of the Society of
Biblical Archaeology; Late Hon. Librarian Philosophical Society
of Glasgow, etc., etc.

"Iron breaketh in pieces and subdueth all things."—Dan. ii. 40.

LONDON: TRÜBNER & CO.
1877.

[The Right of Translation is Reserved.]

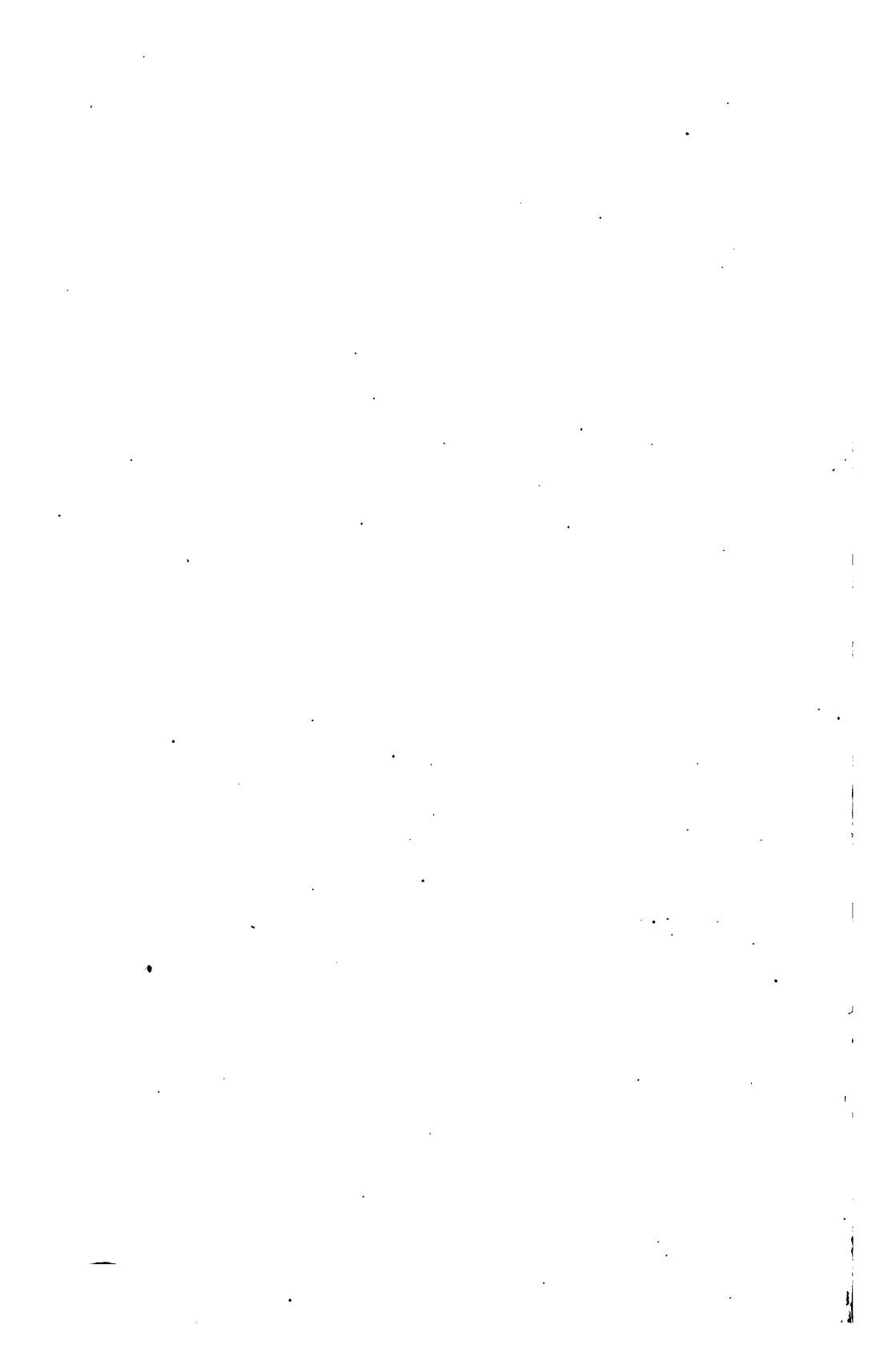
GLASGOW: H. NISBET, PRINTER, GEORGE STREET.

To the Memory of the Author's Mother,

WHO,

ALTHOUGH DEAD, YET SPEAKETH,

THIS VOLUME IS INSCRIBED.



P R E F A C E .

SOME of the matters opened up as more or less intimately connected with the principal subject treated of in the following pages have hitherto been but scantily investigated—certain of them, indeed, quite recently touched; and generally, they lie outside the beaten tracks of the modern student—by the schoolmen, for the most part, passed by—whilst they are spurned with an authoritative air, implying that all about them is known to those who, occupying learned offices, do more or less influence popular opinion. Their examination cannot be expected to enlist the sympathy of “the many.” The alone incentive, to undertaking researches in the regions we have begun to explore, has been the well-founded expectation, that ultimately, after digging as far down through the rubbish heaps as may be possible, we perchance at last approach, if not quite reach, a real knowledge, in some sort or other, of those most ancient times when Man commenced to tread his allotted path on Earth; or, should reliable investigation into such remote recesses be found impossible, then, that we should at least succeed in penetrating sufficiently far to solve certain enigmas, proposed even to this our day by the insignia left behind, of High Intellect—Recondite Mystery—Per-

fection of Execution, and unapproached Grandeur of Conception pervading the earliest known Works of Man—so far back at least as we may get, however inwoven, covered up, and labyrinthic.

To reach such height as we have indicated seems the one proper aim of archæological research; yet, judging from the character of much work which has been done in the past, the attempts which have been made to probe thus far might be counted on the fingers of one hand.

It is palpable from the style of so much of modern Intellectual work, which for most part terminates in the evolution of theories, that it can neither be of permanent value, nor be leading on to recovery of the actual Truth of the world's history; when but a very casual comparison of the theories so evolved, with solid, hard facts (many of which, happily for him who declines to be bound by a theory, still exist, bared to the vision of all who look around with unclosed eye, and mental vision unimpaired), declares such theories to be untenable; while, too, there is abundant indication that we have but to dig deep enough below the surface of things to meet with evidence more stable still.

It is so palpable as to require no detailed exposition, that all attempts which may be made to get at a true picture of the early days of mankind must inevitably fail of that realisation, when those attempts are based

upon an ideal of the human race, as we behold it in our own day, and more especially in those cases where a start is made, as it now usually is, with the doctrine of evolution and the progressive development of the human race as one of the premisses. Of course, accepting any theory as a foregone conclusion, we are at once bound hand and foot; and words are not necessary to prove that all evidence which does not quite fit thereinto, must of necessity be cast aside—for “while the premisses stand firm, it is impossible to shape the conclusion.” Thus it happens when the fashion of the student is to become a “specialist”—the fashion in short of the present age—should he meet with evidence slightly awry with theory, it is either at once passed over, or but slightly referred to; or he indeed sometimes goes right off as far as he can get from the fundamental bearing of things. There is cause, indeed, then, to beware of the “specialist” school, for is it possible that the things which do appear can infallibly be cast aside?—yet, as the condition of society now is, it is easier far to pin our faith in the utterances of popular dictators, who inspire us ever and anon with a new and startling theory, than investigate for ourselves.

Is it to be wondered at, then, that with the growth of this modern “Fashion of Study”—a fashion which commenced in France about a century ago, which in England has grown apace during the last forty years,

is at the present moment sapping to confusion the Teuton Intellect in Germany, and as its necessary outcome spreading Falsehood and Infidelity over Europe, to say nothing of America and the rest of the world!—is it to be wondered at that a revolt has commenced, and that not a few are to be found who, after all, whilst not hesitating to locate to Reason her proper, nay her sublimely exalted work, nevertheless have not ceased to recognise the import and solemn teaching of those other gifts, Consciousness and Insight—monitors, indeed, to him who is of a humble and faithful mind?

The difficulty is enormous to persuade students in this age—an age overbusy beyond precedent—to turn their thoughts in a direction which shall evolve, what may perhaps indeed appear to any one of them in the particular line of research, upon which he has fastened himself limpet-like, but a faint shadow, an airy trifle, light in itself, but which, nevertheless, may prove a real factor in the solution of what, as its utmost, must sooner or later terminate in a certain value for some hitherto unknown quantities—an equation, in short, solved by mutual unison of effort, an element in the yet untaught base of the Arcane Logarithm of all which is Ultimate and Innermost to Man.

The tendency in so many fields of research is to divert studious men from united labour in a common path—a tendency which insinuates itself to each one to become, as it were, a mark—a central luminary—

an intellectual sponge, in very truth, sucking in the seed of knowledge, but giving it not forth to others— spending it upon its own ends, for the sake of advancing its own especial view, bearing no correction, scarce allowing the possibility of error, which the light shed from adjacent sources would, if admitted, eliminate. Such a tendency is probably the most injurious condition, the most blinding hindrance in the way of reaching the ultimates of Truth, which has ever existed. It is to run the mind into a groove, a rut, in which it sees straight ahead only, without taking count of those correcting elements which lay strewn on either side of the hard and fast line which is drawn. In short, the character of a rather numerous class of Inquirers of this age is often to so narrow the field of operation that even moderate limits of deviation are hardly set, a stop is scarce made to test the work by observation as it proceeds, but pushing forward, as the tendency of a pacing age compels, a perfectly clear or rather corrected vision is rendered impossible. Thus it results that much of what we are served with as knowledge is admixed with error, and made to do service to the theories which inevitably are invented, irrespective of sufficient consideration of the question whether those theories accord with or run counter to facts, or to what has been taught in a former age.

The bane of what we again call this "Fashion of study," has perhaps never received more just summa-

tion than in the language of the President of the Aryan Section of the Congress of Orientalists, held in London, when he uttered the following memorable words:—“The danger of all scientific work at present, . . .
“ everywhere, is the tendency to *extreme specialisation*.
“ Our age shows in that respect a decided reaction
“ against the spirit of a former age, which those
“ with gray heads among us can still remember,—
“ an age represented in Germany by such names as
“ Humboldt, Ritter, Böckh, Johannes Müller, Bopp,
“ Bunsen, and others,—men who look to us like
“ giants, carrying a weight of knowledge far too heavy
“ for such mortals as now be; aye, men who were
“ giants, but whose chief strength consisted in this:
“ that *they were never entirely absorbed or bewildered by*
“ *special researches, but kept their eye steadily on the*
“ *highest objects of all human knowledge* ;* who could
“ trace the vast Kosmos of nature, or the Kosmos of
“ the mind, with an unwavering hand, and to whose
“ maps and guide-books we must still recur whenever
“ we are in danger of losing our way in the mazes of
“ minute research. . . . All rivers, all brooks,
“ or rills, are meant to flow into the ocean, and all
“ special knowledge, to keep it from stagnation, must
“ have an outlet into the general knowledge of the
“ world.”

This is indeed a faithful picture, the truth of the

* The italics are mine.—V. D.

drawing, no doubt, being felt by the author's (Max Müller) own experience, to some of whose errors, brought about by his own persistent adhesion to Language-Science, we shall have occasion to refer—a science wherein, as hitherto taught, there are perhaps more pit-falls than in all other sciences put together.

In the midst, then, of such difficulties as those with which we have to contend, and in the absence of such unification of labour as is essential, the writer has investigated, so far as has been possible to him, certain questions in Antiquity, the results of some of which are hereafter set forth.

The age of the Inquisition happily is over ; it is permitted the laymen to investigate for themselves, and they may declare that at which they arrive without risk of condemnation to death for announcing it; although, in the nature of things, that must not seldom run counter to that which rules or is for the time accepted, whether hoodwinked on one hand by priestcraft, or tethered on the other to the theories, falsely called the Science of the period. There is no occasion in this our day, for fear of agonising torture or death, to retract the truth, as once did Galileo; nor to seal it up until the eve of death by the natural efflux or decay of the physical frame, as did Copernicus; still less is there opportunity for the repetition of that great ecclesiastical crime, which a Church,

having departed from the truth, did not hesitate to commit in the martyrdom of Bruno. Instead of Church dogmas coupled with political power, and the suppression of learning outside the Church's pale, we now have the schoolmaster abroad, and endless teachers of science—many rightly, others “falsely so called”—so that all who choose may run and read. The Church having lost her wrongly acquired political power, no longer governs States, still less men's minds; neither the Inquirer, nor he who announces a new truth, can now be led alone before inexorable judges without a cause, without witness or advocate present, and none “but the familiars of the Holy Office, clad “in black, stealthily moving about, the tormentors “and the rack in the vaults below,” as it has been well said by a recent writer—No, he has no such terrors to face; but, on the other hand, he has opportunity in abundance — may be is called to loudly to run and read; on every side he is hailed to pander to all that is new, giving ease, reducing individual effort at attainment to a minimum, to sacrifice at the altar of surfaces, to flow in a current which is popular.

Having made these general remarks on some conditions which surround us, by which it is but too easy to be allured and led off into regions of dissatisfaction and uncertainty, we settle down to the more sober work of our researches into facts long secluded, but

which are real constituents of the bone and marrow of man's true history.

It is incumbent on the author here to explain that this volume is the outcome of three papers which during the last few years, were communicated to the Philosophical Society of Glasgow, and published in the "Proceedings" of that body.* The reception which was accorded to the original papers at the hands of critics and others, encouraged the author to pursue his researches, and ultimately induced him to throw the mass of evidence he has collected into the present connected form, at once accessible to all who might wish to pursue the particular line of archaic inquiry dealt with; and, at the same time, containing more detail than it was possible to include in memoirs of a length suitable for reading to a scientific society. Whilst, then, the work is to some extent a republication of the facts and arguments contained in the original papers, it is but right to say that almost the whole has been rewritten, and the results of later discoveries included.

Publication was intended to have taken place two years ago, and indeed about one half of the work had been passed through the press early in 1875; but

* (1.) "On some evidences as to the Very Early Use of Iron, and on certain old Bits of Iron in particular." April 12, 1871.

(2.) "On some evidences as to the Very Early Use of Iron." Dec. 4, 1872.

(3.) "On the High Antiquity of Iron and Steel." April 26, 1875.

during the latter part of that year the author's leisure had begun to be so much broken in upon, by calls for immediate and pressing attention to other matters, that he had for a considerable time to forego its continuance. This interruption has had the natural issue of imparting to the work more or less of an incoherent character, preventing it from being a continuous or unbroken unfolding of the records which the author has examined, a result which might otherwise have been expected, with the mind undisturbed and fresh with concentration of thought upon the matter in hand.

Whilst, from this interruption, the work is of necessity especially defective, not to allude to other imperfections of which the author is but too conscious, yet he ventures at last to commit it, with all its shortcomings, to those unknown to him; many of whom, perhaps startled with the lop-sided assertions, or mere theories, which it is now common, nay, easy, to promulgate, and even to dignify with the glorious name of "Science"—and that but too frequently, alas! with a total forgetfulness or disregard of the precise meaning of that term—may, possibly, find not a few of the facts in the following pages (now, it is believed, for the first time brought together) not altogether useless.

If the collection of facts hereip contained (for it is to them that attention is requested, rather than to the arguments and inferences therefrom) shall, in ever so

little, help to dispel false theories, or tend to settle vexed questions, the author will consider himself well repaid for the investigations he has undertaken; but that they should find favour with those who, with a crass obstinacy to the verities, on the one hand, unreasonably contend for what is called Science as against Religion, or on the other, for Religion as against Science, he can hardly hope for.

Truly, the author has to admit, that the publication of the entire investigations which he had proposed at the outset, and has even hinted at in the earlier pages, is not contained in the present volume. For two reasons the *arcana* are kept over. *First*, on the ground that since the work was commenced, its range from a philological standpoint has so grown, that the ultimate depths—heights, rather—of recondite significance, with which the “King of Metals” seems to be endowed in its correspondencies to weightiest Truths in the Unseen Universe, are not as yet fully apprehended; and *secondly*, because the Laws of Language—until lately generally accepted—are, after further refinement of analysis, now found to be but, at best, resting on an incomplete and partly erroneous basis, which indeed is to some extent admitted by certain devotees of the Science, so that it has begun to be perceived that Language does not always correspond to a particular race, but in any given condition is most frequently the expression of certain social contacts, the result of

which is, that the true analysis of Language—the absolute genius of roots—is not yet reached. Indeed we may almost say more than this, for what a Real Root is, requires clearer definition than it has yet received; and the conviction is gaining ground—must gain ground, as truer views regarding Language are reached—that each consonant was originally a root in itself; that each single consonant, in its oldest, and, therefore, purest character, had a precisely defined meaning, was a real radical word, ages, perhaps, before the time when man retrograded from the pure and complete knowledge he had at the beginning; losing sight of the recondite signification of the consonants, and leaning only to that which was their outside or manifest meaning, strung them together, and by so doing lost to us, his successors, the real power of Language,—the Real Knowledge of Roots. Through this course it is asserted by some that the things improperly called roots are sometimes monoliteral, as in the Aryan tongues, in which case they consist of vowels; sometimes they are biliteral, and at other times trilateral (such as the Semitic), etc. And this reminds us of what has been of old said by the Brahmins, who go so far as to treat of the radices of letters—that is to say, the real signification implied in their forms. Doubtless when this long-hid Science of Radicals shall be recovered, brightest light shall have returned to our beholding: a light in the presence

of which the true value of things merely utilitarian—those after which man has toiled, vexing his soul, shutting out the true light—will be apparent by dark shadows cast across the fair fields of Truth. A great philosopher once wrote: “The roots of all knowledge are hid away in man’s Language, but the light shineth in darkness. Prefixes, suffixes, and affixes, have done their work in disguising the real sense of words.”

Hence, on further consideration, we have hesitated for the present to publish our investigations too far,—depending, as they do, for much evidence on the true meaning of roots and words—preferring rather to “bide the time,” if that be permitted us, for rigging together the lines from the absolute fundamenta.

The author must not, however, conclude these remarks without recording his obligations to numerous friends, public bodies, and persons of eminence in particular lines of research, who have, in the readiest manner, frequently obliged him with valuable information. To the following his especial acknowledgments are due:—To the Rev. Professor George Rawlinson, Oxford; and, through his ready intervention, to his eminent brother, Sir Henry Rawlinson; to Professor Piazzzi Smyth; to Dr. Samuel Birch; the late George Smith and Mr. Newton, of the British Museum; to the Trustees of the British Museum; to Dr. Lepsius, of Berlin; to Dr. Percy, F.R.S., of the Royal School

of Mines; to Mr. Henderson and the Rev. Dr. Edkins, of Pekin; to Mr. Isaac Lowthian Bell, M.P., F.R.S.; to Mr. W. J. Cockburn-Muir and Mr. William Petrie; lastly, to his assistant, Mr. G. M. Cruickshank, to whose pencil the work is indebted for the illustrations which are scattered throughout its pages. In every case where the writings of others have been used, the author believes they will always be found duly acknowledged; and regretting the rather long list of "Errata," the unfortunately usual accompaniment of a pioneering task, but for which the author particularly craves his readers' indulgence, he issues this product of the odd moments of what could scarce be called leisure.

GARSCADDEN, DUMBARTONSHIRE, *May, 1877.*

TABLE OF CONTENTS.

CHAPTER I.

WAS IRON USED BY PRIMEVAL MAN.

	Page
Progressive Development of Man—Theoretical Stone, Bronze, and Iron ages—Inconsistency of the theory with fact—Man acquainted with Iron from the earliest ages, and probably with Steel also—Insidious properties of Iron, and which belong to it alone—M. Goguet starts the Theory of Development—Denial of the Theory by the Metallurgists, and by Dr. Percy in particular—The Theory reborn in Scandinavia—Kjökkenmødding testimony incomplete—Greek Poets on the Metallic ages—Testimony from Hissarlik, the site of Homeric Troy—Dr. Schliemann's researches—Discoveries at Troy invert the Theoretical Order of the Ages,.....	1

CHAPTER II.

PRÉLIMINARY REVIEW OF SEVERAL EVIDENCES.

Metallurgical Trophies from Oriental Countries—Iron Sickle from Karnak—Oriental Countries of necessity to be appealed to—Max Müller wrong, and contradicts himself—Semitic and Hamitic testimony—Period of Semitic Infusion—Testimony of the ancient Egyptian language—Properties of Iron isolate it—Criticism of Max Müller's assertion that heated Copper is hardened by immersion in water—Copper softened by immersion—Iron, by virtue of its insidious qualities, became a type of sacred correspondences—Sufficiency of grounds for doubting the dogma of an universal succession of Stone, Bronze, and Iron ages—Meteoric Iron—Mr. Gladstone's Homeric Researches—Mr. Gladstone wrong in his conclusions—Gladstone and Schliemann—Iron reduced without fusion—Archaic Indian Iron and Steel—Colonel Pearse's Find—Testimony of Lepsius—Archaic Monuments disprove the theory—Metallic Iron from Memphis—Malleable Iron found in the Great Pyramid by Howard Vyse—Arab cunning—Hekekyan Bey and Leonard Horner's Nile-mud pits—Greek and Chinese Steel—Aristotle's and Leih-Tze's records—Fusion unnecessary to produce Iron—Sir Gardner Wilkinson tested—Dr. Lepsius and the Rev. Basil Cooper's evidence—Hieroglyphic testimony—Proto-Egyptian word for Iron—The Rev. Basil Cooper in error—Egypt a Riddle to Evolution—Estimate of certain work done—Chevalier Bunsen and William Osburn compared—Osburn's testimony—Caution of an Orient Sage,	12
--	----

CHAPTER III.

WEIGHTIER TESTIMONY FROM EGYPT AS TO ARCHAIC IRON-WORKING.

	Page
Egypt further interrogated—Testimony of Egyptian Priests—Theory as to Meteoric Iron being a primitive source of Iron insufficient—Meteoric Iron not forgeable—Egyptian and Kaffir Iron—The Amakosas—The “Assegais”—Cape Colony and New Zealand—Unexpected Phœnician evidence—Phœnician Inscriptions in Brazil Dr. Farrar on the Phœnicians—The Mentone Inscriptions—Egyptian Iron, whence obtained—Sinaitic Iron-works—Mr. Hartland's discoveries in the Sinaitic Peninsula—Egyptian Hieroglyphics for “Iron”—Testimony of Lepsius—The authorities cited—Uncertainty of some Hieroglyphic Signs—“Bones of Typhon”—Egyptian Colours for the Metals—Proto-Egypt's “Iron King”—Proto-Egyptian Iron-works—Proto-Egyptian Flint Implements—Wady Meghara—Proto-Egyptian Tools—Iron from the Great Pyramid examined—Analysis of,	51

CHAPTER IV.

BABYLONIAN, PROTO-CHALDEAN, ASSYRIAN, AND HEBREW TESTIMONY.

Mesopotamian evidence—The Babylonian records—Metallurgy of the Chaldeans—Assyrian Iron—Iron and Steel Tools from Assyria—Iron Pick from Nimroud—Saw from Nimroud—George Smith's recent Assyrian “Finds”—Cuneiform characters for Iron—Hebrew testimony,	102
---	-----

CHAPTER V.

PHœNICIA, GREECE, AND ROME.

Phœnician testimony—The Idœan Daktyls—Greek Steel—Modern Greeks—Pliny's statements—Toledo Swords—The Coliseum and Arch of Titus—Iron at Pompeii,	130
--	-----

CHAPTER VI.

INDIA.

Indian evidence—The Delhi Lâht—Colonel Yule on the Iron Lâht—General Cunningham on the Iron Lâht—Syud Ahmed on the Iron Lâht—Traditions respecting the Lâht—Age of the Lâht—“Cootub,” meaning of the word—The Suastika and Pramantha—Sacred “Krisses,” forging of at Lombock—Forging large masses of Iron—Forging of the Lâht—Iron Beams of Hindoo Temples—Kananur—The Vimanas—Ancient Indian Iron—Iron and Steel from Wurree Gaon—Non-rusting of the Iron Lâht—Religious import of the Lâht—Wootz—The manufacture of,	143
--	-----

Table of Contents.

xxiii

CHAPTER VII.

CHINA.

Chinese evidence—Antiquity of Steel in China—Chinese words for Iron and Steel—Ancient Chinese Steel processes—Similarity of Chinese and Greek Steel processes—Different kinds of Chinese Steel—Value of Chinese Steel,.....	Page 179
---	-------------

CHAPTER VIII.

MISCELLANEOUS.

Miscellaneous—Mr. Gladstone's recent admissions—Use of Steel by the Greeks—The Geologists—Pre-historic Archæology—Estimate of Language—The Cave Deposits—White coating of Flints—Kent's Cavern—Breccias—Sir Charles Lyell on the formation of Breccias—Inversion of transported Strata—Influence of River and Tidal action—Climatic Influences—Boyd Dawkins on the Growth of Stalagmite—His Tests of the Jockey Cap—Table of Measurements—Geological Time—Physical Agencies—Return to the East—Admissions of the Geologists—Biblical Chronology—M. Lenormant on date of appearance of the Human Species—Testimony of Revelation and Mythology—Schliemann's discoveries at Mycenæ—American Hæmatite (Iron) Axes—The Caucasus—Caucasian Steel—The Chalybes—The Os of Ossethi, or "Iron" race—The verb <i>ir, er</i> , &c.—Heri, Hera, and Iron—Max Müller on Aryan Languages—The Sanskrit "Ara"—Hermes Triamegistus—His celebrated axiom—Reply of the Deltas—Apparent Chronology of Jewish Scripture and Physical Facts—Conclusion—Letter from Mr. I. L. Bell, M.P., &c.,.....	187
--	-----

APPENDICES.

Appendix A. Iron Masses in Greenland,	233
„ B. The Manufacture of Large Masses of Iron in India,....	237
„ C. On the Recondite Nature of the Iron Låht,.....	241
„ D. Chinese Iron Manufacture,	250
„ E. The Evidence of Flints,.....	255
„ F. Degradation of Races,	262
„ G. On the Asserted Discovery of Human Bones in the Ancient Fluvial Deposits of the Nile and Ganges,..	263
„ H. Cave Life in Scotland,.....	265
„ I. Early Intercourse between Egypt and China,.....	266
List of Works referred to in this Volume,	271
Index,	273

LIST OF ILLUSTRATIONS.

PLATES.

- (1.) Sickle found by Belzoni under the feet of Sphinx at Karknak (*frontis-piece*).
- (2.) Piece of Malleable Iron removed by blasting from the solid masonry of the Great Pyramid (*page 35*).
- (3.) The Iron Láht at Delhi (*page 145*).
- (4.) Table of ancient words for Iron and Steel (*the End*).

WOODCUTS.

	Page
The Assegai,	55
Egyptian Iron Smelting,	87
Cartouches of Shofa and Nu-Shofa,	89
Hieroglyphic of Sephuris,	91
Sephuris at Wady Meghara,	93
Soris and the Canaanites at Wady Meghara,	95
Suphis and Nu-Suphis at Wady Meghara,	97
An Iron Pick, from Nimroud,	113
A Double-handled Saw, from Nimroud,	113
The Galgala or Gilgal,	134
Section of Toledo Sword-blade,	140
The Suastika,	160
Section of <i>Vimana</i> ,	170
Iron Hatchet, from America,	218

ERRATA ET CORRIGENDA.

THE following errors have been detected, but the author will feel obliged if any reader finding others will point them out, by addressing a memorandum of such to his publisher, or to himself:—

Page 17, line 5th from top, delete "whilst."

Page 20, line 9th from bottom, for "préeminently," read "pre-eminently."

Page 20, line 5th from bottom, delete "which is."

Page 23, line 5th from bottom, for "Appendix," read "Appendix A."

Page 24, line 14th from bottom, for "another," read "any other."

Page 33, line 3rd from bottom, delete "we have."

Page 36, line 4th from top, after "Andrews" delete comma.

Page 37, line 4th from top, after "state" insert comma.

Page 39, line 7th from top, for "five," read "three."

Page 46, line 13th from bottom, after "so," insert "as."

Page 62, line 7th from top, for "Iron-steel," read "Iron or Steel."

Page 74, line 13th from top, for "Oriside," read "Osiride."

Page 76, bottom line, for "Chompoll," read "Champoll."

Page 105, line 13th from top, for "Henry," read "George."

Page 134, bottom line, for "Pranantha," read "Pramantha."

Page 160, line 13th from bottom, for "Emile," read "Emil."

Page 177, line 5th from bottom, delete "or."

Page 178, line 5th from top, after "Wootz," insert comma.

Page 181, line 15th from bottom, after "China," insert comma.

Page 189, line 16th from top, for "he bore," read "the hero bore."

Page 202, line 5th from bottom, before "Ingleborough," insert "the."

Page 203, line 4th from top, after "Dawkins," insert comma.

Page 207, line 5th from bottom, for "our," read "an."

Page 216, line 15th from top, for "material," read "materials."

Page 249, bottom line, for "Buckhardt," read "Burckhardt."

THE PREHISTORIC USE OF IRON.

CHAPTER I.

WAS IRON USED BY PRIMEVAL MAN?

SOME years ago in North-West Europe there was announced as new, a theory which had been propounded in France more than a century earlier, but judging from the small extent to which that theory seems to have become at first known or accepted, it appears to have soon been exploded in the land of its birth. The theory here alluded to assumes for its basis that Man is a creature which has undergone in the past, and probably is still undergoing, an incalculable course of progressive development, from which conclusion it inevitably follows, that in the course of fashioning materials to his requirements, and in the providing himself with instruments for the obtainment of his food, clothing—for the chase and cultivating the soil—he of necessity commenced to deal with those substances which are soft, easily cut, dressed, and handled, until by degrees advancing, he proceeded to use in place of them, those which were harder or more refractory, and as the outcome of this assumed progression he eventually became acquainted with the soft, and lastly—the hardest *metals*. This

view, too, seemed, on its second announcement, to find favour not only in North-West Europe, but at last in our own country; and its reconstruction, arose from the examination of the contents of the Peat-mosses and those heaps called by the Danes, “Kjökkenmödding,”* scattered over Denmark and the coasts washed by the Baltic, in which are found several more or less soft and easily handled substances, shaped into a variety of forms, which were concluded to be tools. The late Sir Charles Lyell† says of those heaps—“Scattered all through them are flint knives, hatchets, and other instruments of stone, horn, wood, and bone, with fragments of coarse pottery, mixed with charcoal and cinders, *but never any implements of bronze, still less of iron.*” The foundations of the theory were again strengthened by the not finding, until examining deposits which were said to be of a later age, harder materials, such as the metals; and the issue of these investigations was the announcement to the world of the famous Stone, Bronze, and Iron succession of Ages—a doctrine which has taken fast hold of men’s minds, but which, on close inspection, appears to be quite contrary to all which the human mind not merely perceives as natural in Man, but equally contrary to the most wide-spread evidence, and opposed to that which is most ancient and sacred also.

It is not consistent with the experience of remote ages, still less with reason, that man should progress from a mere familiarity with implements of bone, wood, or stone—materials which are acted upon easily with one another—to the reduction or extraction of

* That is kitchen-refuse heaps.

† *Antiquity of Man*, p. 12.

the metals from the ores laid up in Earth's fertile womb, which require the skilful use of fire and fluxes to separate them; but it is, on the other hand, quite consistent that he should, when once in possession of the superior knowledge requisite for the extraction and working of the metals, be able to deal with the much more easily manipulated, bones, wood, or stones, when occasion should demand; also, it is reasonable, nay natural, that if tending downwards, that is to say, undergoing degradation, instead of upwards, he might in long ages altogether lose the higher knowledge he had at first, and retrograde into that of a grim savage, using nothing better than bones and stones. Such a retrogression is in many cases known to be historically true.

The proposition we have to establish, then, is quite the reverse of the teaching conveyed by the foregoing famous theory; and we shall work on to it by discussing some of the facts upon which the said theory has been erected, thereby advancing into what we have found to be sound evidence to the contrary. Instead of the evidence we have to consider—much of which has hitherto been ignored, whilst not a little has only now been brought to light—proving such a succession of ages as that to which attention has been directed, it will be perceived that the very earliest period which modern research has yet reached back to on the Earth, is an age in which the human race is fully equipped in the knowledge and use of all serviceable materials simultaneously—not in any way progressive; that the earliest of all substances with which man was acquainted was unquestionably Iron, and almost

4 *Properties of Iron Known to the Ancients.*

certainly Steel—and that this is equally true, whether we look to Egypt, Babylonia, or Proto-Chaldæa, and Assyria on the one hand, or China on the other.

Yet for any one at the present day to profess to write a complete record of the facts bearing upon the extent of knowledge possessed, respecting, and the use made by the ancients of Iron, would be nothing short of arrogance; for there can be no doubt remaining in the minds of those who have really given close attention to the subject, and who are acquainted with the facts which exist, that many more facts still remain to be brought to light, the most recent investigations having added numerous proofs in that direction, as will hereafter be shown.

Equally arrogant would it be to profess to reach as yet the unfathomed esoteric depths of meaning with which the ancients had been taught to regard that metal; a metal beyond all others endowed with properties of the most subtle kind, and with some of the most insidious of which they were acquainted—properties, indeed, possessed by Iron alone, and not approximated to in any other substance then or since known!—properties so extraordinarily insidious, that it became the one substance by which, as under comparison, or by virtue of some inherent correspondence, they expressed or revealed to one another, even as in their sacred writings or oral traditions were revealed to them, truths perhaps incapable of being otherwise conveyed with the depth and force of meaning which was essential. Several of the passages in the Hebrew Scriptures, as well as in the mythological books of the ancients, teem with references to this metal, and which

its properties alone make intelligible; these both direct as well as indirect, or parabolic allusions, being again sufficient proof of a familiar acquaintance with the uses and properties of Iron by those who compiled them—to which it must be added, that the very name, or rather succession of names, which that metal has borne through all time is unequivocal evidence of the sanctity and importance in which it was held.

It is generally admitted that the art of extracting metals from their ores is of very ancient origin, and until recently it has been supposed by those who have followed the dogma first propounded in France by M. Goguet (although that supposition is in direct conflict with all literary testimony, whether sacred or profane), that Iron was among the last, if not the very last, of the metals which man succeeded in reducing to his requirements. We trust, however, ere the task we have set ourselves is complete, to have at least brought together tangible evidence which shall go far to show, that after all, the literary records of the ancients are true, and that the whole contents of the sacred writings are not hurriedly to be cast altogether aside, because in point of chronology they are not found by some latter-day investigators, with our imperfect reading, to be all-fours with some of the lithic inscriptions and the second or third hand dynastic tables of a certain Sebennyte priest or scribe.

It were idle to dilate upon the importance, whether from an ethnic or other point of view, of possessing a reliable collection of the evidence bearing upon primeval metallurgic art and science; for totally apart from other considerations, the intrinsic interest of the subject itself,

from a high archaic stand-point alone, is sufficient cause for its being earnestly examined, while the real use which has already been, and unquestionably will yet be made of even such information as we already have, in educing clearer and therefore truer views of the ancients, their times, their knowledge, and certain of the conditions by which they were influenced, mark out the subject as one peculiarly worthy of our serious attention.

It not only, then, has appeared to the writer, but his view has been abundantly confirmed by those eminently qualified to judge, and that notably by Dr. Percy, that the hypothesis which has been advanced, namely, that Iron did not come into use until long ages after Copper and its alloys, is founded on the most fragmentary and one-sided data, Dr. Percy, in a letter to the writer, giving his conclusion in these words: "I become more and more confirmed in the opinion that archæologists have been generally mistaken concerning the so-called 'Iron Age.' I am collecting further information on the subject from time to time, and as yet have met with nothing in opposition to the opinion above mentioned."

The theory, then, which we are bent on discussing, has been reborn in Sweden and Denmark, under the auspices of MM. Thomsen, Nillson, Steenstrup, Forchhammer, and Worsäae, has been dealt with by M. Morlot in Switzerland, and accepted by the late Sir C. Lyell and Max Müller in Great Britain. Max Müller, whilst following M. Morlot in the latter's dealing with the theory, has conducted independent investigations thereon in the region of philology. Strange it is that

those highly-gifted men who have followed this theory, and who have endeavoured to arrange the results of their research so as to fit into it, appear to forget one invariable fact, namely, this: that at all times, as now, civilization was simultaneously at various stages of advancement or retrogression in different parts of the world, that when, as it has been made to appear, judging from the present contents of the Peat-mosses and Kjökkenmödding, bones and flints were the best tools and weapons of North-West Europe, those of nations far to the East were of Iron, and as we shall see hereafter, in some cases almost certainly Steel. But because Iron has not been found in the Kjökkenmödding is that sufficient for pronouncing positively that the so-called Iron Age had not been reached at the time of their formation? The fact of charcoal and cinders being found associated with their other contents is evidence—although admittedly not conclusive—in favour of Iron-working having then been practised. Still, those who framed the theory seem not to have realised that it is next to impossible for Iron, if coeval with the other contents of the heaps, to have come down to our own times, when exposed, as the Kjökkenmödding have always been, to the moist and saline atmosphere of a northern sea coast.

And yet because none is so found it is contended that in North-West Europe the Early Iron Age did not commence until about 250 A.D.,* after which time Iron relics are found. Nevertheless, as it is our intention to extend the present enquiry over a wide area

* "Denmark in the Early Iron Age." By Conrad Englehardt, late Director of the Museum of Northern Antiquities at Flensburg. London, 1866; p. 4.

of the Earth's surface, it is but a very small matter indeed, whether the foundations for the theory are fixed beyond controversy in Denmark or not, or if the succession of Ages be indeed true for that region, we shall bring evidence to show that it is not generally true, and certainly not true for those countries in particular which were the earliest peopled, wherein the mightiest nations of the Old World lived, and in which the most momentous deeds of the human race have been accomplished. It is just as impossible in the arts, even as it is impossible in palæontology and other sciences, to fix a horizon common to all the world at the same time. Further, this view as to the position which Iron occupied in the order of its use seems only to find a parallel in the minds of those Greek poets who sang the praises, the marvels, the good and evil of a succession of ages, which they typified or symbolised in the order of Gold, Silver, Brass, and Iron respectively, even as we read in Hesiod, Aratus, and others.

Yet whilst Greek poets so wrote, it would now appear to be in direct antagonism to facts belonging to the period immediately preceding the times in which they flourished, if even they were not quite within their own ken—for the recent memorable researches of Dr. Schliemann* into the mound of Hissarlik in the Troad—whether he really has succeeded in there disentombing the Ilion of Homer or not—indicate that he has dug down far enough to get at hard facts, and to have found relics, with every appearance of probability, belonging to a time preceding the establishment there

* *Vide* "Troy and its Remains." By Dr. Henry Schliemann. London, 1875.

of a Lydian dominion, or, at the lowest estimate, about 1400 B.C., and extending thenceforward over a period of at least 1700 years. Dr. Schliemann has found the superposed foundations of no less than four successive cities, but notably has not met with a progress from a lower to a higher order of things, in any sense whatever; the city, indeed, which he—and that with extremely strong evidence in his favour—has pronounced to be Troy, of which Priam was king, being the second from the bottom (that a still older city), with the Palace, Treasure, Tower, Wall, and double Scæan gate, of which Homer has sung, still extant. The construction of the overlying cities is progressively inferior, until terminating in the Greek Ilian colonists, who had ceased to cut and dress stone, building their houses of wood. This, however, is speaking only of facts which run parallel to those with which we more immediately have to deal. If we then interrogate Dr. Schliemann on the evidence respecting the Stone, Bronze, and Iron Ages, he tells us at once that the theory is all assumption, and not borne out by a single fact or relic to be met with in the Hill of Hissarlik; for there in the ruins of every city he finds knives, hatchets, and arrowheads of flint, diorite, and very hard transparent green stone, by thousands, in immediate contact with other thousands of ornaments and articles of utility, formed not only of Copper and Bronze, but of Gold also; and whilst in the older deposits neither Iron nor Steel have been met with in the metallic state, yet certain relics, which have somewhat dubiously been denominated "sling bullets" of Iron in a state of oxide, were found in them, side

by side with the Flint, Copper, and Bronze instruments. Tin also was absent,* although mentioned by Homer, but Iron relics, still metallic, were found in the uppermost deposits.

The results, then, of our research have, just at the moment of passing these pages through the press, received a further corroboration in the publication of Dr. Schliemann's unique investigations—which we are fortunate in having to acknowledge—and they certainly prove, in his own words, that whilst “it
 “ has been hitherto thought that the occurrence of
 “ stone implements indicates the ‘Age of Stone,’ my
 “ excavations here in Troy, however, prove this
 “ opinion to be completely erroneous; for I very
 “ frequently find implements of stone even immedi-
 “ ately below the *debris* belonging to the Greek
 “ colony, that is at a depth of $6\frac{1}{2}$ feet, and they
 “ occur in very great quantity from a depth of 13
 “ feet downwards. Those, however, in the Trojan
 “ (that is to say, in the earlier) *stratum*, from 23 to
 “ 33 feet below the surface, are in general of *much*
 “ *better workmanship than those above.*
 “ I have collected many hundreds of them. But to-
 “ gether with the thousands of stone implements I
 “ have collected many of copper; and the frequently
 “ discovered moulds of mica-schist, for casting copper
 “ weapons and implements, as well as the many small
 “ crucibles and small roughly made bowls, spoons,
 “ and funnels for filling the moulds, prove that this
 “ metal was much used:” to which he
 adds, “weapons and implements of pure copper were

* One of the metals which is rapidly oxidised.

“ employed contemporaneously with enormous quantities of stone weapons and implements ”—and side by side with these, in the oldest or Trojan ruins, we have, as already mentioned, the so-called oxidised sling bullets of Iron, which have been analysed by M. Damour.

In respect, then, of the result adduced from digging into the rubbish heaps of Hissarlik, Dr. Schliemann's English editor, Mr. Philip Smith, most appropriately remarks: “ Such facts as these furnish a caution against the too hasty application of the theory of the Ages of Stone, Bronze, and Iron.”*

* “ Troy and its Remains,” 1875: Preface, pp. xxii., xxiii.

CHAPTER II.

PRELIMINARY REVIEW OF SEVERAL EVIDENCES.

WHEN certain researchers into the "Antiquity of Man"—supposing him to have been, at last, unfolded after successive cycles of evolution from an extremely low type of organic existence—claim that the appearance of Iron on the scene marks so decided a step on the road to a higher civilisation, it is strange, indeed, that their inquiries into the remotest limit of time, when man came to use Iron, bear no stamp upon them indicative of having been directed either into the earliest ages of which, or in countries where, we have positive contemporary testimony—actual contemporary fact to rest upon—rather than that a continued trust should be vouchsafed to very uncertain records and theories as concerning other countries and still later ages, but founded only on mere probabilities.

Writers on what has hitherto been defined as the early history of Iron we have had in abundance, since the time when Layard deposited in our British Museum the metallurgical trophies of his excavations in that Interamnian plain where once stood Babylon and the Assyrian Nineveh; or since Rhind, after exploring the tomb of Sebau, wherein he is reported to have discovered, "on the massive doors of the inner repositories,

“hasps and nails, still as lustrous and as pliant as on “the day they left the forge,”* contended that Iron was extensively used in Greece between the epoch of the Homeric poems (from 900 B.C. to 1000 B.C.) and the full historic period of Greece, and that within about the same interval, if not probably with an earlier commencement, the same metal was more or less completely displacing Bronze in Egypt. It is inferred by Rhind that Sebau was born about B.C. 68, and died B.C. 9; but whilst merely referring incidentally to Rhind's discoveries at this place, we shall hereafter see that Iron was known to and used by the Egyptians, Chaldeans, Assyrians, Chinese, and Indians, many centuries nay, milleniums, earlier; also that, before the time of the Persian invasion under Cambyzes, there was enough Iron in the country, as Belzoni has pointed out, to make instruments of agriculture with. Plate I. is a picture of a sickle † found by Belzoni under the feet of one of

* “Metallurgy: Iron and Steel.” By John Percy, F.R.S. London. 1864.

† Extract from “Narrative of the Operations and Recent Discoveries within the Pyramids, Temples, Tombs, and Excavations in Egypt and Nubia, etc., etc.” By G. Belzoni. A.D. 1821. Published by Murray.

“Two other articles were found in this excavation, of which one is a tombstone, and the other an *Iron sickle*” (p. 162). . . .

“But the Iron sickle, to which I would call the attention, was found under the feet of one of the sphinxes on its removal. I was present; one of the men took it up and gave it to me. It was broken into three pieces, and so decayed that the rust had eaten even to the centre. It was rather thicker than the sickles of the present time, but exactly of the common shape and size of ours. It is now in the possession of Mr. Salt. The question is, At what time were these statues placed there? They could not have been deposited subsequently to the age of the Ptolemies; for it appears that since the time of Cambyzes, who destroyed the gods of Egypt, the country has never been invaded, so as to compel the people to conceal their idols; and it is evident that these statues had been hidden in a hurry, from the irregular and confused manner in which they lie. Now, as the sickle was found under the statue above mentioned, I think it is a sufficient proof that there was Iron in the country long

the sphinxes at Karnak,—a sufficient proof that, at about B.C. 600, the blacksmith's art was well understood and practised in Upper Egypt; so that whilst the testimony we hope to adduce may be no refutation of Rhind's view in regard to Iron displacing Bronze there at the particular time he mentions—for it is quite within the limits of probability that, in many countries and from a variety of causes, such as the failure of supply, Iron may have for a time fallen into disuse, in which case some of the other metals and certain alloys may have for a time supplied its place—yet the evidence to be hereafter dealt with, will, we venture to believe, show, that to Egypt, Babylonia, Assyria, India, China, and not Greece, must our attention be addressed for the solution of all problems bearing on the most ancient metallurgy.

By the distinguished leader in another branch of modern investigation the true history of Iron has had a thick veil cast over it. We have previously alluded to Professor Max Müller, who, operating from a purely philological basis, has propounded a supplement to the conclusions arrived at by MM. Goguet, Thomsen, Nillsson, Steenstrup, Forchhammer, and Worsäae; but on examining his greater, yet not unerring work, the "Science of Language," it is easy to see that he has been largely influenced by M. Morlot's conclusions, for he quotes M. Morlot extensively; and from the use of certain words in the Homeric writings, concludes that the Greek language was spoken before

before the invasion of the Persians, since the Egyptians had enough to make instruments of agriculture with. Sickles of the same form are to be seen in many agricultural representations in the tombs," etc., etc. (p. 163).

the discovery of Iron, and that Iron certainly was not known previous to the breaking up of the Aryan family. Yet the extreme inconsistency with which this distinguished scholar publishes the statement we have referred to in one book and its negation in a companion volume is something intensely inexplicable—misleading, and in such serious inquiries as those in which we had hoped to look up to him as to a master for guidance and instruction, not to say dangerous, but altogether unintelligible. The statement that Iron certainly was not known previously to the breaking up of the Aryan family was made at the Royal Institution, London, in 1863; and in 1873, ten years afterwards, we have no less than the seventh edition of the lectures there given,* with the same statement identically,—whilst during the decadal interval since then elapsed, from the same author there has appeared that other famous mythologic and philologic treatise, “Chips from a German Workshop,”† asserting that “*before the separation of the Aryan race . . . there can be no doubt that Iron was known, and its value appreciated, whether for defence or attack;*” and in both instances philological evidence is adduced in support of these very counter statements—for utterly irreconcilable they are,—yet, as we are bent on digging into things with the view of discovering the true state of some pertinent questions connected with primeval times, we deem it the better course not to discuss further for the present the inconsistencies we have

* *Vide* “Lectures on the Science of Language,” by F. Max Müller. Seventh edition. London, 1873. P. 254.

† Edition of 1868, p. 47.

met with, but rather to put them on record side by side, their contrast when so arranged being more than sufficient to arouse doubts as to the soundness of conclusions drawn from the evidence of Language-Science alone, unaided by light from other sources:—

*From pages 254-5, Vol. II., of
"Lectures on the Science of Lan-
guage." Ed. 1873.*

"Though the use of Iron was
"known before the composi-
"tion of the Homeric poems,
"it certainly was not known, as
"we shall see presently, pre-
"viously to the breaking up of
"the Aryan family. . . . What
"makes it likely that Iron was
"not known previous to the
"separation of the Aryan na-
"tions is the fact, that its
"names vary in every one of
"their languages."

*From page 47, Vol. II., of "Chips
from a German Workshop." Ed.
1868.*

"That the value and useful-
"ness of some of the metals
"was known before the sepa-
"ration of the Aryan race can
"be proved only by a few
"words, for the names of most
"of the metals differ in differ-
"ent countries. Yet there can
"be no doubt that Iron was known,
"and its value appreciated,
"whether for defence or for at-
"tack. Whatever its old Aryan
"name may have been, it is
"clear that Sanskrit *ayas*, Latin
"*ahes* in *aheneus*, and even the
"contracted form, *æs*, *æris*, the
"Gothic *ais*, the old High Ger-
"man *er*, and the English *Iron*,
"are names cast in the same
"mould, and only slightly cor-
"roded even now by the rust of
"so many centuries."

By virtue of the necessity of introducing the foregoing quotations at this place, the philological side of this investigation has suddenly touched against us, and having so come to view we make use of the contact at once by asserting, in the tenor, though not quite in

the letter, of the second quotation, that it points to what is the essentially true conclusion, as it is hoped will subsequently be shown.

But whilst having drawn two such extraordinarily diverse conclusions, and whilst even continuing to publish the same, through several successive editions of both works, Professor Max Müller has apparently overlooked what may be gathered as to the Early use of Iron from other great branches of the human family—namely, the Semitic and Hamitic—to which last-mentioned branch both modern Coptic and ancient Egyptian most probably belong,* although he himself

* Regarding the family to which the Egyptian language properly belongs, it may be sufficient to illustrate the uncertainty which exists on this point by quoting the following from a recent work.* “In the opinion of various scholars, the ancient Egyptians represent the most primitive form of Semitic speech, in which case of course the Coptic, which is its lineal representative, would also be regarded as a Semitic language. Now in the Bible, *Mizraim*, the common name of Egypt, is made a son of *Ham*, not of *Shem*, and “to this fact we should of course attach a very considerable importance in deciding against the Semitic origin of the Egyptians, were it not almost certain that these invaluable Biblical genealogies in Genesis x. are meant to point rather to great geographic zones than to direct ethnological affinities. The facts respecting the Egyptian language are these. While some of those who argue most strongly for the Semitic character admit that on the whole it differs as widely from Semitic as Semitic from Aryan, yet they prove that in the pronouns, and in the manner of affixing them, in the numerals, in the assimilation of consonants, in the subordination and instability of the vowel, and in other general syntactical features, it presents a Semitic aspect; or on the other hand it is argued that, side by side with these Semitic elements are found Hamitic or Negritian elements of a wholly different character; that in roots (the majority of which are monosyllabic) it differs very widely from Semitic languages; that many of the grammatical resemblances reduce themselves to that vague general identity of form without which human language would not be human language at all; that in general character, no less than in physical formation, the dark race, whose very name of Chamite may indicate their swarthy complexion, differs widely from the fairer Semites.” . . .

* “Families of Speech,” page 83. By the Rev. F. W. Farrar, D.D., F.R.S., &c. London, 1873.

has indeed pointed out that these are of the Semitic family, but which conclusion will scarce find accept-

"It is certain, too, that, whether they stood to each other in the relation of conquerors or conquered, the Jews and Egyptians regarded each other with cordial abhorrence.* The soberest conclusion seems to be to consider the question as still an open one, and for the present to *exclude Egyptian from the dignity of being a kind of anti-historic Semitism. It must be classed with a separate branch of Hamitic languages*, such as Berber and Touareg, which extend along the entire north of Africa, and which, while they were still in a condition of 'primordial fusibility,' *i.e.*, while they were still plastic and impressible to a degree not possible at a more developed stage, were undoubtedly subjected to a period of powerful and continuous Semitic influences."

While, then, the learned author from whom we quote the foregoing passage has so plainly indicated that ethnologically the Egyptians are to the Semitic races as black is to white, yet that from their language it is clear of there having been a long distant, a primeval period, in which a large infusion of Semitic elements into their tongue took place, still he does not point out any period or occasion under which that influence was brought to bear. Now it seems to us that that infusion not only could, but judging from the most careful investigation of an enormous mass of evidence, which no one has ever ventured to seriously question, did take place during the first Shepherd invasion, when a Semitic race, under the leadership of a high and right-souled Patriarch, who afterwards became king of Salem, either drove from before them, or dwelt peacefully with, the ancient Egyptians, occupied Lower Egypt, prevailed upon the King Cheops to introduce monotheism as opposed to the polytheism of the Hamites, to close their temples, and compel the people by thousands to hew, dress, and convey from various parts of the land, hard and soft as well as enormous blocks of stones, in order to erect there at the head of the Nile Delta, that one solemnly unique monument, teeming with Semitic reference and types, the Great Pyramid of Jeezeh, to the character of which period, the monuments, and notably those of the Wady Meghara abundantly testify. If this sudden indwelling of Semites was warlike, it seems indeed to be the ostensible cause of that hostile feeling existing so long between the Hamitic and Semitic races—a feeling which lasted on with extremest bitterness, and which was exemplified in later times on the occasion of the Semite patriarch Jacob being advised by Joseph as to his address to Pharaoh when he should be summoned before him on arriving in Egypt, praying that he and his people might be allowed to sojourn in Goshen, out of immediate contact with the Hamites, "for," as he was instructed to urge, "every Shepherd is an abomination unto the Egyptians," as we read in the touching narrative, Gen. xlvj. It is of the utmost importance that the confusion which exists as

* The "Go ye not into Egypt" of Jeremiah (xlii. 20), was a prohibition arising from centuries of evil experience.

ance now; * indeed, judging from the last edition of his lectures,† it would almost seem that Max Müller, too, is prepared to yield the position he formerly assumed.

The testimony of the ancient Egyptian language, as well as modern Coptic, has of late thrown a flood of light on the subject of this inquiry. Yet, before passing on from Professor Max Müller, we must notice—for we should fail in our duty were we to omit doing so—another still more remarkable error into which he has fallen, *by trusting, it would seem, too exclusively to language-science*—by, in truth, following too closely his specialty and omitting to take notes by the way-side. This error occurs in the following sentence:—"In the
" Homeric poems, knives, spear-points, and armour
" were still made of Copper; and we can hardly doubt
" that the ancients knew a process of hardening that
" pliant metal, *most likely by repeated smelting and im-*
" *mersion in water.*"‡

to the true Shepherd or Hyksos period should be wiped out; and there is no difficulty in getting rid of the confusion if we attend carefully to the monuments—to Sir Gardner Wilkinson, Manetho, and others—the former of whom distinctly refers to the "original Hyksos," and the latter to "the return of
" the Shepherds" in a later dynasty. But in a mere note like the present, we must refrain from touching the proofs in this most interesting line of research with which we have incidentally fallen in, and leaving that for exposition possibly at some future time, we conclude this note with the following becoming passage from Mrs. Hamilton Grey's "History of Etruria":
" Investigating the early history of the world, the Hyksos cross our path
" like a mighty shadow, advancing from native seats to which it baffled the
" geography of antiquity to assign a position, covering for a season the shores
" of the Mediterranean and the banks of the Nile with the terror of their
" arms and the renown of their conquests, and at length vanishing with a
" mystery equal to that of their first appearance."

* "Lectures on the Science of Language," vol. ii. p. 254. London, 1866. First Series. Longmans.

† Edition 1873, vol. i. p. 326.

‡ "Lectures on the Science of Language," vol. ii. p. 255. London, 1873. Longmans.

Now, what exactly the phrase "repeated smelting" may mean, as used in this connexion, it is difficult to assert; but as *smelting* involves *heating*, we conclude that the phrase should rather be "repeated heating." But whether we are correct or not in that inference is of no consequence; for, as a pure matter of certainty, it is well known to those who are technologically informed, that, unlike Iron, Copper is *not hardened* by immersion or cooling in water, but, directly on the contrary, it is thereby *softened*; indeed, it is the constant practice of coppersmiths and other craftsmen, when desiring to soften that metal or its alloys, to heat it and cool it in water, whilst it is hardened by rolling, beating, or pressing; and one of these latter operations was doubtless not unknown to the Greek makers of knives and spear-heads in Copper. It would appear, indeed, as if Max Müller, having made himself acquainted with the fact that whilst Iron or Steel when heated is hardened by immersion in water, had concluded, therefore, that Copper was similarly hardened. Precisely the reverse, however, does take place, and in this fact alone we may, if we will, begin to perceive glimpses of those insidious qualities with which Iron, being préeminently endowed, so early became a type of sacred correspondencies, its very polarity, indeed, singling it out sensibly from any other known substance—ever pointing, ever attracting and being attracted, across a state of things which is awry to the poles of an axis of Rectitude—its attracted union or coitus with the Unseen but all-pervading force with which nothing short of an Universe is endowed; incontestably proving the influences by which it is affected

to extend from pole to pole, from sphere to sphere—cutting, too, dividing asunder, repelling all that is unattracted, non-assimilating; at once, as if with a perpetually-compelling spell, urging all that lies not closely parallel with the mAGNEtic axis to assume a position at right angles thereto, and transfixing such as with an unceasing, eternal stab, branding it as opposed and DIA-mAGNEtic.

The paucity of researches bearing on the knowledge and use of Iron in pre-historic ages, as we have already hinted at, has of necessity resulted, as its direct outcome, in too hasty conclusions, and notoriously in that dogma propounded by the Danish and Swedish antiquaries, Thomsen, Nillson, Steenstrup, Forchhammer, and Worsaaë.

Upon the beginnings of man, in *some* parts of the world at least, to do his work with stones, it is no business of ours just now to enter: nor, indeed, does there seem occasion to do so, for the conclusions in that connexion appear, so far to be drawn from lamentably *incomplete* testimony. But, concerning the further question, as to whether Bronze and Iron came *universally* to be employed in the order of succession now assigned to them, amongst each of the sections of mankind which are grouped according to the character of their languages into the Aryan, Semitic, Hamitic, and following Dr. Farrar, the Allophyllian or Sporadic families, we have, it is believed, sufficient grounds to question.

It is asserted, as we have already mentioned, that the appearance of Iron on the scene is an index to certain guides of our own times, that a higher civiliza-

tion prevailed than where Bronze is present, as may be gathered from the following passage of Sir Charles Lyell's writings, when quoting M. Morlot,* he says:—
 “The next stage of improvement that is manifested
 “by the substitution of Iron for Bronze indicates an-
 “other stride in the progress of the art. Iron never
 “presents itself except in meteorites in a native state;†

* “Bulletin de la Société Vaudoise des Sciences Naturelles,” tom. vi., p. 292.

† To assert that Iron never presents itself in a native state excepting as meteorites, is to assert what is not proven, for, indeed, the weight of evidence rather tends to reverse that conclusion.

Native Iron is known of three different classes, namely (*a*), nearly pure, or telluric Iron; (*b*) nickeliferous or meteoric Iron; (*c*) native Steel-iron. It had long been a matter of dispute whether telluric Iron really existed, but whilst very rare, the following instances of its occurrence should, we think, be sufficient to set that question at rest. Telluric Iron has been found either in small grains and plates, or in masses and disseminated. In colour it is almost purely white, resembling Silver to the eye; it is said by some to be more malleable and ductile than ordinary malleable Iron, and its specific gravity varies from 7 to 7·8. This class of native Iron is always combined with small proportions of other substances, such as Carbon, Lead, Copper, Silica; but, unlike native Iron of class *b* (meteoric Iron), it does not contain nickel. At Gross Kamsdorf, in Thuringia, a mass of telluric Iron was found with magnetite; it was analysed by Klaproth, and found by him to contain—

	Per cent.
Iron,	92·5
Lead,	6·0
Copper,	1·5
	<hr/> 100·0

In structure the specimen was foliated and texture crystalline. It is also stated that at Liberia, in Western Africa, considerable quantities of telluric Iron are found. The subjoined analyses show it to be the purest yet examined:

	Per cent.	Per cent.
Iron,	98·87	98·40
Silica,	9·63	1·60
	<hr/> 100·50	<hr/> 100·00

The Liberian Iron is said to be soft and flexible; it can be easily cut with the chisel, and the natives use it for instruments. In a vein at Oule, near Allernont, in Dauphiné, telluric Iron was found by Schreiber. In 1786, a mass of native Iron, said to have weighed upwards of thirty tons, was found in South America, and a specimen of which has been sent to the British Museum. It

“ so that to recognise its ores, and then to separate
“ the metal from the matrix, demands no small exer-
“ cise of the power of observation and invention.”* To
the metallurgist, however, who is conversant with the
art and science of extracting metals from the ores,
and of compounding them together as alloys, the pic-
ture at once presents a different view ; and it is indeed
some satisfaction to know that the Bronze and Iron

has been described as soft and compact, although the more internal portion
has numerous cavities. It has the appearance of having been in a state of
fusion, and is considered by those who have examined it to be a product of
volcanic agency. We are not aware of any analysis of it having been made;
indeed, it is asserted that this specimen has not been analysed.

In Philips' Mineralogy, edit. 1864, an account is given of a vein in mica
slate two inches thick which has been found at Canaan, in Connecticut; it
contains—

	Per cent.
Iron,	91·8
Carbon,	7·0
	<hr/> 98·8

The large proportion of carbon in this specimen is extraordinary, and much
of it is probably diffused throughout the mass in the graphitic state. An-
other specimen has been found at Pen Yan, in New York. “John states
“ that it is mixed with the platina grains from South America ; and more re-
“ cently M. Molmar has affirmed that he has found native Iron in the Gold
“ Sands at Otáhpian. It is also stated that native Iron with 6 per cent. of
“ silica and a little sulphur, has been found with galena in the veins at Lead-
“ hills (Scotland); and Mossier has found volcanic Iron in lava at Graveniere,
“ in Auvergne. It had a steel grey or silver white colour, foliated texture,
“ and hackly fracture.”—(*Art. “Iron,” Ure's Dict.*) Lately large masses—
one of 44,000 lbs. weight—have been found in Disco Bay, in Greenland, it is
said, in basalt; but as it appears this specimen contains nickel (“Nicol's Ele-
ments of Mineralogy, p. 279), it is most probably of meteoric origin; and
quite lately a most interesting discussion has been kept up by MM. Nörd-
kensjöld, Nauckhoff, and Tschermak as to the telluric or meteoric origin of
these numerous large masses of Iron (see Appendix). It is also said by Nicol
to be found in basalt in the north of Ireland; and Kurr mentions it as
occurring in the platina sands of the Urals and in the basalt of Antoine.

* “The Geological Evidences of the Antiquity of Man, &c.” By Sir Charles
Lyell, Bart., F.R.S. London, 1863.

order of succession does not receive the assent of our leading living metallurgist, Dr. Percy.

Not a little singular, too, is it that we observe, side by side with unquestionably a most powerful effort to yield up in another tongue the soul and spirit of Homer, that even the Right Hon. W. E. Gladstone has allowed himself to be entrapped into the universal application of the Stone, Bronze, and Iron snare, to which he seems to have vouchsafed assent by virtue of the uncertainties attaching to one or two Greek words used by Homer in his references to metallurgic operations, or it might possibly, with perhaps a closer approach to the truth, be alleged that by virtue of having assented to that theory on *à priori* grounds; that very circumstance has introduced the difficulties which Chapman, Brandreth, and Lord Derby, not to say Pope, with what appear to be his extensive errors, and other translators untainted with it experienced not.* Of course, if we accept this theory, or another as fixed and unalterable, in an argument, we are then tied hand and foot, and no exposition is needed to show, that "where the premises stand secure it "is impossible to shape the conclusion."

Yet with this reference to the Homeric age, we are conscious of laying ourselves open to the just taunt: "Of what use is it to waste time over an affair so "comparatively recent and far off from that much "nearer approach to the actual beginning of things, "which can be reached in other countries—in Egypt; "Assyria, Phœnicia, or Tsidon, for example—from one

* *Juventus Mundi*, ed. 1869, chap. xv., section iv., p. 525—"Metals in Homer;" also, "Contemporary Review," May, 1874, p. 843.

“ or more of which we learn all that art of metal-working of which the Homeric poems have handed down to us an account more or less intelligible, even “ as they themselves testify ? ” Most true, we reply ; but then it is so excessively easy, because popular, and following the spirit of the age, not unfrequently expedient, to pin our faith upon and yield obedience to the utterances of those who have held high office, that it scarcely occurs to any but an extremely small number to question or submit to criticism the dicta which but too frequently are propounded in popular and enticing form from high quarters.

It would ill become the present writer to question the extraordinary effort made by Mr. Gladstone, and doubtless the in general invaluable results accruing from his laborious investigation of the Homeric epic, but the fact of his announcing the “ Age of Copper ” as “ the first and oldest of the metallic ages, which pre-“ cedes the general knowledge of the art of fusing “ metals,”* shows him to be totally unacquainted with practical facts of metallurgy, upon which, however, he has not hesitated to propound so foregone a conclusion, a conclusion which, however, is inevitable, once the theory is accepted, as it has been shown to have been accepted by Mr. Gladstone. Indeed, it is clear that the difficulties in Homer may be to some great extent swept away by the use of that theory, if we can shut our eyes sufficiently to the facts of metallurgic science, for it enables us to say of “ χαλκός, which has, by mere “ license of translators, been interpreted Brass,” that it “ can only mean Copper,” as if shutting out the

* *Juventus Mundi*, p. 528.

pretty general acceptance of χαλκός, corresponding to the Latin *æs*, which, according to the best authorities, signifies any of the crude, ignoble metals, the exact metal in any case being indicated by an adjective, such as ἐρυθρός, * red; αἶθος, black or hot; μέλας, black; or πολίος, of iron-colour; grey, bright; χαλκός, signifying metal in general, apparently, indeed, corresponding to the proto-Egyptian hieroglyphic value *ba*, which, according to the latest information, also probably means metal in general,† the exact metal under mention being indicated by a prefix, signifying some peculiar or inherent quality, such as colour, by which it is certainly known. But more of this hereafter, when we come to dwell more especially on Greek iron-working, it being perhaps a sufficient answer to the difficulty for the present to point out that Homer mentions seven metals, including Iron, and another, κυανός, which, judging from its peculiar blue colour, has been generally concluded to mean Steel.

It is true that Copper is frequently found in a native or metallic state, and so soft or ductile that it may at once be hammered, or if heated and suddenly cooled, may be rendered so soft, as still more easily to be hammered into shape; but, then, if the art of working in Copper precedes the art of “fusing metals,” as Mr. Gladstone alleges, then it necessarily follows, that all the Copper used in very ancient times, (and in respect of the enormous quantities of which there were used, archæological research into long buried

* Iliad, ix. 365—

ἄλλον δ' ἰσθίοντι χρυσὸν καὶ χαλκὸν ἐρυθρὸν
ἥδι γυναῖκας ἐυζώνους πολὺν τε σίδηρον.

† *Vide Post.*

cities, tombs, etc., is continually furnishing renewed and unequivocal proof,) must have been found native; for without fusion, it is next to impossible, even after roasting, to bring the ores of Copper, which usually contain sulphur, Iron, and other substances, to the compact metallic condition: so that, if fusion be the difficulty, it may be a complete answer to the position to assert at this place, what will be expounded further on, that Iron is the metal which, *par excellence*, is easily reduced to the metallic condition *without fusion*, and was, in fact, reduced without being raised to the temperature of fusion in the oldest known process for working it, and which process we shall presently show was used by the Egyptians in the Sinaitic peninsula during the fourth dynasty, or as early as 2200 B.C., at least 1200 years, as near as we can compute, before the Homeric epic was written—which epic is replete, too, of Egyptian learning from the later, Upper or Theban kingdom.

Further, if it be true indeed that Dr. Schliemann has reached the veritable Ilion of which Homer sang, and if it be further true that, as Mr. Gladstone asserts, Homer was not acquainted with the fusion or casting of metals,* then we can arrive at no other conclusion, than either that Homer is incomplete or ignorant of what had been practised in Troy, or that Mr. Gladstone's limitation of the meaning of what Homer intended to convey in his allusions to the metals

* "Juventus Mundi," p. 529.—"Had Homer been conversant with the fusing or casting metals, this is the very place (the formation of Achilles' shield) where we must have become aware of it, especially as his works of skilled art are all of Phœnician origin or kin, and his Hephasitos is a god of Phœnician associations.

and to metallurgical operations is in the strictest sense unwarrantable; for Schliemann has found in that very place which, through all tradition, too, is the site of Ancient Troy, the actual moulds of mica-schist in vast numbers with the articles cast in them, as we pointed out in the preceding chapter, together with the instruments used in pouring the fused metal and for filling it into the moulds.

That school, however, which claims the higher antiquity for Bronze or Copper seems to infer that because no Iron specimens are pointed out so old by centuries, perhaps by thousands of years, as this spear-head, that chisel, this bowl, or that hatchet of Bronze or Copper, that Iron could not have been previously used; and we are not aware that any one has yet attempted to prove that an Iron specimen has been found in the whole world which could be pronounced even so old, not to mention older, than any one of the many Bronze or Copper relics of which such a legion exist; indeed, when we reflect upon a certain peculiarity inherent to the metal Iron, and, for our present considerations, practically absent from Bronze and Copper, it does appear scarcely possible that a specimen of metallic Iron should be found belonging to nearly so early an age as that to which even tolerably late Bronze and Copper specimens belong; for we need only to be reminded that Iron, when exposed to the action of the air or moisture, even in a very few years, becomes converted into an oxide, and so entirely, that it is often not possible to recognise whether it had previously been reduced to the metallic condition or not, although we must not omit stating that we were,

during the recent Congress of Orientalists,* assured by Colonel Pearse, when receiving explanations from him at the British Museum respecting that most unique collection of ancient Iron and Steel tools which he has brought from Wurree Gaon, near Kamptee, in India, that it is quite possible to detect the difference between Steel and Iron in a state of complete oxidation, and to pronounce on the oxide whether, when in the metallic form, the mass had been Steel or Iron.

The Proto-Egyptian remains, monuments, etc., in Lower Egypt are allowed by all men of all creeds, and, in particular, on the authority of Lepsius,† to be the oldest extant relics of works of the human race (some of them not only the most stupendous, but the most perfect in mechanical excellence that we can ascertain to have at any time been erected on this

* Held in London, September, 1874.

† As the evidence which the very earliest known building extant brings to our aid, is so convincing in proving the extremely early use of Iron, it is well to lay before the reader the testimony of the very first Egyptologist of this age on the unexampled antiquity of that wondrous monument.

In his "Letters from Egypt," Lepsius says:—"Nor have I yet found a single cartouche that can be safely assigned to a period previous to the fourth dynasty.

"The builders of the Great Pyramid seem to assert their right to form the commencement of monumental history, even if it be clear that they were not the first builders and monumental writers."

"The Pyramid of Cheops, to which the first link of our whole monumental history is fastened immoveably, not only for Egyptian, but for universal history." Edit. 1843. See also the chronological arrangement of the unrivalled plates of Lepsius' greatest work, the "Denkmaeler"—those of the Great Pyramid being placed first in order—although in that unparalleled example of the modern manufacture of chronologies, exhibited by Dr. Owen to the Ethnological section of the London Congress of Oriental scholars, the Pyramid of Sahara was, to the amazement of many there present, assigned a first place in the order of age, whilst both the Pyramid of Sahara (usually called the "Step Pyramid") and the Great Pyramid of Jeezeh were on that not-easily-forgotten table placed centuries previous to the Noahitic Deluge!

Earth, and but for which inherent quality they would long since have passed out of the reach of our eye-witness—as many others of a lower order of mechanical construction, and of far later date, have passed away, even so that their place can nowhere now be found), and confronting these primeval structures with the Stone, Bronze, or Copper and Iron succession dogma, educed, as we have shown, from France, and now re-echoed more especially by Scandinavian philosophy, it behoves us to ask—How does the dogma fit the facts before us in respect of Proto-Egyptian, Babylonian, Assyrian, Indian, Grecian, or even Chinese testimony? In accents not disinfected of positivism we seem to hear the supporters of that dogma re-echo, “Exactly;” “for of Bronze it has been said that it was compounded of such proportions of the two metals that the resulting alloy was so hard that it would cut stone just as well as the Steel chisels and jumpers of to-day; and therefore it must have been used upon those extremely early erections.” This is, however, we are disposed to believe, rather a begging of the question, and specially illogical. For we may surely in all fairness ask, that since Bronze is so slowly oxidizable, if it really was used in Lower Egypt, on these the very earliest works of man, should

and in regard to which it has since been so truly remarked by Mr. Cockburn-Muir, that “we were told by a great *savant*, whose fame in his special department is deservedly European, but who, elsewhere since, has described ‘himself, some would say, with an exquisite irony of accuracy, ‘a dabbler in ‘old bones,’ we were told that the Great Pyramid of Ghizeh dated from ‘before the Flood. The one thing wanting to perfect the singular chronological table on which this was set forth seemed to be to set down the Flood ‘itself as having occurred *before the Creation*. That would effectually dispose of all difficulties in the premises, by leaving no difficulties to dispose of.”

we not find some specimens of it in or about these said monuments? Yet, so far as we have been able to ascertain, *not a single Bronze relic* has been found throughout the whole Nile valley which can *with certainty be pronounced so old as either the material or hieroglyphic testimony which we now possess regarding Iron.*

But to turn again to the question of the priority of Iron, from another branch of evidence, how does the investigation result? Not, as we should expect, according to the Stone, Bronze, and Iron succession doctrine, but precisely the reverse of that; for not only are Iron instruments depicted in the tomb pictures of the 4th dynasty at Memphis, but at Memphis itself: among the monuments there, metallic Iron has been found, and is now in this country of ours. Not only is metallic Iron found in that very locality to-day, but remarkably so, it has been found in the very oldest building of all there—and, by the universal accord of all who are competent to judge, the very oldest building in the whole earth; not in that particular building either, in such a way as to have been placed there by accident or intention, at a time subsequent to the erection, but in such a way as that it could have been placed there when, and only when, the structure was in course of erection. It may perhaps appear startling to be told that, after a plate of malleable Iron was removed by blasting it out from the solid masonry of the Great Pyramid by Colonel Howard Vyse, thirty-nine years ago, and which has been ever since deposited in the British Museum, we have altogether failed to meet with an allusion to it by any writer on the history

of metallurgy, whilst by the Egyptologists, although confessedly well known to some of them, its existence has never been referred to, until notice was first directed to it by the writer in 1871* This piece of Iron to which we refer was not dug up amongst any rubbish or concreted mass of matter at the foundations of the Pyramid which have there accumulated, but was obtained out of the solid masonry near the top of the building, as the following passage and certificates, quoted from Howard Vyse's "Pyramids of Gizeh," testify.

"Mr. Hill discovered a piece of Iron in an *inner* joint, near the mouth of the southern air-channel, which is probably the oldest piece of wrought Iron known.† It has been sent to the British Museum, with the following certificates:—

"This is to certify, that the piece of Iron found by me near the mouth of the air-passage in the southern side of the Great Pyramid at Gizeh, on Friday, May 26th, was taken out by me from an *inner joint, after having removed, by blasting, the two outer tiers of the stones of the present surface of the Pyramid; and that no joint or opening of any sort was connected with the above-mentioned joint, by which the Iron could have been placed in it after the original building of the Pyramid. I also showed the exact spot to Mr. Perring on Saturday, June 24th.*

"J. R. HILL.

"CAIRO, June 25th, 1837."

"To the above certificate of Mr. Hill I can add, that since I

* *Vide* Proc. Phil. Soc. Glasgow, vol. vii. p. 476 and plate.

† "Lord Prudhoe is said to have brought from Egypt an ancient Iron instrument; and I thought that I had perceived the remains of an Iron fastening in the chamber containing the sideboard or shelf in the great temple at Abou Simbal. In fact, *stone could not have been quarried without metal, which must, therefore, have been in use in the earliest times. The smelting of metals seems to have been an antediluvian art.*"

"saw the spot at the commencement of the blasting, there have been two tiers of stones removed, and that if the piece of Iron was found in the joint pointed out to me by Mr. Hill, and which was covered by a large stone, partly remaining, it is impossible it could have been placed there since the building of the Pyramid.

"J. S. PERRING, C.E.

"CAIRO, June 27th, 1897."

"We hereby certify that we examined the place whence the Iron in question was taken by Mr. Hill, and we are of opinion that the Iron must have been left in the joint during the building of the Pyramid, and that it could not have been inserted afterwards.*

"ED. S. ANDREWS.

"JAMES MASH, C.E.

"The mouth of this air-channel had not been forced—it measured $8\frac{1}{2}$ inches wide by $9\frac{1}{2}$ inches high—and had been effectually screened from the sands of the desert by a projecting stone above it."

Since then, the Great Pyramid is absolutely the oldest building on every testimony, both that of Herodotus, the hieroglyphs, and astronomy, as proven by the researches of Lepsius, Wilkinson, Fergusson, Herschel, and Smyth; and whereas Iron is found there and Bronze is not; and whereas it is doubtful whether any Bronze relics found near Jeezeh are so old as the Pyramid, we think the proof is clear to the most obstinate, that for Iron we must claim an antiquity far higher than that hitherto assigned to it. Yet some will doubtless object to such a conclusion, seeing that it is only a *single* specimen which, so far, has been found. It must not, however, be forgotten that had not this specimen been in the position which the certificates we have handed down to us point out, that is

* This piece of Iron has been examined by the author, and further reference to it will be found in the following chapter.

to say, walled in, removed from contact with the corroding influence of the atmosphere and moisture, but in an exposed position, even it, could not have come down to our day; so that if, as doubtless there may have been, numerous tools of Iron, or perhaps, nay, almost certainly Steel, left in that locality by the Pyramid builders, it is beyond doubt that unless enclosed, as the specimen under notice was, not one of them would have lasted until now, even in that driest of climates—in Egypt.

Before, however, we do, from the evidence afforded by this particular specimen of Iron from the Great Pyramid, commit ourselves to certainly assigning it to be of contemporary date with that monument's erection, we have, in order to act fairly towards all parties, to ask ourselves whether it is not probable that it may have been surreptitiously dropped into the place by some wily Arab, just after the stones surrounding its site were blasted away—for some persons will doubtless be found sceptical on that head—when remembering the cunning with which modern Arabs are reported to drop fragments of pottery and burnt brick into Nile-mud excavations, on purpose to find them afterwards, so as to entitle them to baksheesh from the exploring parties. If this piece of Iron from the Great Pyramid had been found so recently as the times when the Nile-mud excavations were carried on, wherein Arab sagacity was evoked to the craft of practical wrong-doing in the prospect of reward, we should be disposed to place little trust indeed in its testimony; but whereas it was removed from the Pyramid some twenty years before the time when Hekekyan Bey and Mr. Leonard Horner



began sinking pits and boring in the Delta, and in whose day it would appear that the Arab trick was developed; and whereas the finding of metallic specimens in the Pyramid was no part of Howard Vyse's inquiry, whilst the finding of pottery specimens in the Delta was well known to be the especial business of the later investigators, and since no one has as yet shown that crafty Arabs were aware that there was a theory of Stone, Bronze, and Iron ages which needed their subtle trickery for its support,—it does not look in any way reasonable to suppose that the Iron found its way there so surreptitiously; and as a positive argument against the validity of that suggestion, the very condition of the piece of Iron itself may be noticed, as shown by figs. 1 and 2, Plate II.*—namely, the fact of pieces of nummulite limestone—indeed, the trace of a nummulite itself—of which very stone the Pyramid is built, still adhering to it; and this condition of the piece of Iron certainly is valid evidence of its having been built

* This Plate, as well as Plate I., show the Iron specimens full size, and have been copied from photographs specially prepared by Mr. Stephen Thompson.

The author's friend, W. Petrie, has been kind enough to spend much time, at his request, in the examination of this piece of Iron from the Great Pyramid; and in writing him regarding it, says,—“Thickness originally, probably $\frac{1}{2}$ inch. In some parts it is now $\frac{1}{4}$ or more, including the scale of rust, and in other parts it thins off to nothing. The side having the label upon it is much rougher than the other side; and on this side is a trace of a nummulite, in lighter colour than the Iron, concreted on it; and there is also a nodule of stone, $\frac{1}{4}$ inch diameter, projecting from the surface, and sinking into the rusty mass. Judging from general appearances and weight, not more than half of what now remains of it consists of rust,* the remainder is probably yet metallic. The colour of the rust is the usual dark-brown or blackish, not reddish; and it is a very hard and solid kind of rust, like the magnetic Iron ore. It has evidently been flexible, tough wrought-Iron.”

* From my own subsequent examination, I should say that considerably more than one-half of it is still metallic.—ST. J. V. D.

into the Pyramid, and therefore contemporary with the the period of erection of that monument, which conclusion the unmistakeable language of the three certificates of Messrs. Hill, Perring, Andrews, and Mash all confirm in the most emphatic terms. Yet we still have additional evidence from other sources to ratify our conclusions. But, before speaking of that further evidence, we wish to consider another matter.

It is asserted by many persons now-a-days, who, it would appear, are but little versed in metallurgic science, that Iron indicates a further acquaintance with metallurgic art than Bronze indicates. This is a conclusion not only erroneous, but one to which no practical metallurgist would assent.

Looking broadly at the face of metallurgic science, it is scarcely possible to point out a simpler and more readily occurring result, than the reduction of Iron ores to the metallic condition, in the manner wherein that is effected without the production of Cast or liquid Iron. We must remember that there is not sufficient evidence as yet collated to enable us to declare that Cast Iron was known to the most ancient nations; although in the fluid form, yet not for making castings, it was unquestionably known to the Greeks as well as to the Chinese about 350 to 400 B.C., as we gather from Aristotle's and Leih-Tze's records of the process of making Steel, of which more hereafter. Certain writers, however, and amongst them a well-known author on the metallurgy of the ancients, Mr. James Napier, has written, that the *reduction* of Iron ore is performed by mixing the oxide of the metal "with " coal or other carbonaceous matters, and subject-

“ing them to a heat of sufficient intensity to *fuse* “them.”* Now, it is well ascertained, as the result of a very long experience, that Iron may be reduced from the oxides to the metallic state *without fusion*; indeed, in the most perfect blast furnace operations, the Iron is reduced by carbonic oxide before the charge reaches that region of the furnace where fusion takes place (the smelting zone of Scheerer). When fusion does take place, we get from the furnace either Cast Iron or Crude Steel, the Iron being combined with a portion of the carbon of the charge. From what we know of the most ancient methods of reduction (and let us not forget how very little we do really know respecting them; let us rather open our eyes to the unexpected facts which investigations in the East are continually startling us with), the *fusion* of the metal was by them impossible. Hence the attempts in modern times to extol the difficulty of Iron-making, by supposing its *fusion* to have been necessary, and therefore raising it high above the state of knowledge requisite for the more complex operations of forming an alloy out of two dissimilar metals, are not only incorrect but extremely misleading. The same author, to whom we have already referred, even goes so far as to say that “the smelting and manufacture of Iron is “surrounded with so many difficulties, and needs so “many requirements and such skill, that we would

* “Ancient Workers and Artificers in Metal.” By James Napier, F.C.S., &c. London, 1856. P. 132.

And Sir Charles Lyell, as if borrowing his information from Mr. Napier, goes somewhat farther, when he writes—“To *fuse* the ore requires an intense “heat, not to be obtained without artificial appliances, such as pipes inflated “by *human breath*, or bellows, or some other suitable machinery.”!!!

“ expect it to have been amongst the last of the “ metals that were brought into use.” Now, from what has been said, and from what follows, it will, we believe, be admitted, as the only conclusion from the side of pure reason alone, that *not only is Iron the very first metal which we should expect to find brought into use,* merely on account of the simplicity by which it is reduced from its ores—namely, by heating the oxides in contact with carbon, and maintaining that contact for a length of time sufficient to allow the carbon, by a process analogous to that of cementation, to attack the oxygen to the innermost parts of the lumps of ore, resulting finally in a mass of malleable Iron or a crude Steel, ready to be re-heated and hammered into any shape desired; but furthermore, we see at once that that conclusion is in exact confirmation of the oldest literary records we possess, namely, the hieroglyphs, the Cuneiform Inscriptions, Proto-Chinese literature, and next to them the Sacred Hebrew Scriptures, as will hereafter be seen. Whilst, then, we have been thus led to direct attention to the tendency towards those erroneous conclusions with which Sir Charles Lyell and Mr. Napier have helped us, yet we must also point out that the latter gentleman upsets his own conclusions by showing from literary and monumental proof, that the use of Iron was at least coeval with Bronze, if not anterior to it; and that in so far he has much aided those who view the subject from the metallurgist’s stand-point; for, quoting Sir Gardner Wilkinson, Mr. Napier says:—“ Iron and Copper “ mines are found in the Egyptian desert, which were “ worked in old times; and the monuments of Thebes,

“ and some of the towns about Memphis, dating more
“ than 4000 years ago, represent butchers sharpening
“ their knives on a round bar of metal attached to
“ their aprons, which, from its blue colour, can only
“ be Steel.”*

Sir Gardner Wilkinson himself, too, as late as 1847, when the third edition of his famous five volume work † was published, has written—“ The most remote point
“ to which we can see opens with a nation *possessing*
“ *all the arts of civilised life already matured.*” Which passage contrasts strikingly with another in the same volume (p. 59),—“ It was about the same period, B.C.
“ 1406, ‡ that some suppose the use of Iron to have
“ been first discovered in Greece; but whether it was
“ already known in Egypt or no, is a question hitherto
“ unanswered. We are surprised at the execution of
“ hieroglyphics cut in hard granite and basaltic stone,
“ to the depth of two inches, and naturally enquire
“ what means were employed—what tools were used?
“ If the art of tempering Steel was unknown to them,
“ how much more must our wonder increase? and the
“ difficulty of imagining any mode of applying Copper
“ to this purpose adds to our perplexity.” It is singular that so faithful and fair-dealing an author as Sir Gardner Wilkinson, one, too, so pre-eminently versed, after his long residence in Egypt, with the facts relat-

* “The Ancient Workers in Metal,” p. 133. London, 1856.

† “The Manners and Customs of the Ancient Egyptians” (p. 8), Preface. London, 1847.

‡ “Hesiod (in his *Opera et Dies*) makes the use of Iron a much later discovery. In Theseus’ time, who ascended the throne of Athens in 1235 B.C., Iron is conjectured not to have been known, as he was found buried with a Brass sword and spear. Homer generally speaks of Brass arms, though he mentions Iron.”

ing to its history, and writing, too, so many years after the deposit of the Great Pyramid Iron specimen in the British Museum, and being in general so exact a scholar, should assert that "whether Iron was already known in Egypt or no, is a question hitherto unanswered." We can only suppose that, like others, this question appeared to be unanswered simply because it had not been directly enquired into—but was accepted as proven from collateral evidence merely—after the manner indicated by Lepsius, in concluding a letter to the author dated from Berlin, Feb. 17, 1873, wherein he states—"There was no doubt for myself that the use of Iron in Egypt was at least as old as the quarries of granite, and granite blocks are found abundantly in the oldest Pyramids. But the fact had escaped my notice, as well as the notice of Wilkinson, that Colonel Vyses', or rather Perring's, researches had brought to light the piece of Iron hermetically isolated (in the Great Pyramid); also the other fact was new for me, that Iron may be worked before it becomes fluid."

Since, however, Wilkinson, Lyell, Morlot, Thomsen, Steenstrup, Worsäae, and others, have published their views to the world, Egyptological research has not stood still; on the contrary, it has been prosecuted with continued energy, resulting, in so far as our present purpose is concerned, with some striking corroborations of the use of Iron, not only so early as the Great Pyramid age, but earlier still; for we find, as it has been so learnedly set forth by the Rev. Basil H. Cooper,* that

* Trans. Devonshire Association for the Advancement of Science, Literature, and Arts. 1868. Paper entitled, "The Antiquity of the use of the Metals, and especially of Iron, among the Egyptians."

there is well ascertained hieroglyphic evidence of Iron being known in Egypt even so early as the sixth or seventh monarch of the *first* dynasty.

Mr. Cooper says,—“It must, I think, be conceded
“ . . . that supposing Iron to have been known
“ to the Egyptians . . . its employment in the
“ construction of those Titanic erections, the Pyra-
“ mids, . . . is far more probable than the
“ hypothesis that none but Bronze tools were used.
“ And this, I venture to think, can be satisfactorily
“ demonstrated.

“The proof is based on the extremely significant
“ Coptic word for Iron, as illustrated and explained by
“ the mode in which it is written in the hieroglyphical
“ inscriptions, and on the occurrence of that word as a
“ component element in the name of an Egyptian
“ Pharaoh belonging to the first dynasty. The mo-
“ dern Egyptian word for Iron is, in the Sahidic dialect,
“ which is considered to be the purest, *Benipi*, or, with
“ a slight change in the final vowel, *Benipe*.* In the
“ hieroglyphical form of the language it is the same.
“ . . . Its first element is BA or BE (in the Coptic
“ BO), meaning ‘hard-wood,’ or ‘stone;’ and the two
“ letters which spell the word are often accompanied
“ in the hieroglyphical inscriptions by a picture of the
“ squared stone, such as those of which the pyramids
“ were built. At other times, as if to remind us that
“ the word originally meant ‘hard-wood,’ and that it

* Sometimes the initial B is replaced by P, in which case the word is written *Penipe*, as I am informed now by Dr. Lepsius. This is singular, and in some sort finds its correspondence in the Hebrew and Chaldee. In the former the word for Iron is *Barzel*, in the latter, *Parzel*; but more as to this hereafter.—Sr. J. V. D.

“ was only in process of time that it came to denote
 “ ‘hardware’ in general, including such stone hard-
 “ ware as was going in very early times, the picture
 “ illustrating the spelt word was a branch or sprig.
 “ The middle syllable in the word *Benipe* consists of
 “ the letters NI, with a very short vowel. It is a pre-
 “ position, answering to the English ‘of.’ The last
 “ element in the composite word is the syllable PE,
 “ which is the Coptic word for heaven, or the sky.
 “ And that this is really its signification here is
 “ proved incontrovertibly by the pictures with which
 “ this syllable is wont to be accompanied in the hiero-
 “ glyphical orthography of the word, *Benipe*; for it
 “ is the picture invariably used to denote the heaven
 “ or the sky, and is employed for no other purpose.
 “ Properly, it represents the ceiling of a temple,
 “ which was regarded as itself a representation of
 “ the sky, the true ceiling of the true and original
 “ temple; and the picture is accordingly wont to be
 “ emblazoned with stars. Hence,” says Mr. Cooper,
 “ the signification of the entire word *Benipe*, . .
 “ although it could not for some time be conceived
 “ why the Egyptians should have called Iron by so
 “ singular a name as ‘stone of heaven,’ ‘stone of
 “ the sky,’ ‘sky-stone.’

“ Some time afterwards, however, it occurred to
 “ me that this was the very name which would
 “ naturally be given to the only Iron with which men
 “ were likely to meet in a natural state. There is
 “ but one exception to the rule that Iron is never
 “ found native, like gold and some other of the
 “ metals; that exception is in the instance of *meteoric*

“*Iron*,* which might surely be called with propriety
“ ‘the stone of heaven, or of the sky.’ Moreover—and
“ I have to thank my friend Mr. Pengelly for reminding
“ me of the fact, and so materially helping me to shape
“ out my crude speculation—meteoric Iron needs no
“ preparatory process, as does that procured from ores,
“ to render it workable. In short, we may be sure,
“ especially with the light thrown on the matter by
“ this invaluable Egyptian word, bright with the
“ radiance of that heaven which enters into its
“ composition, that with this wondrous matter from
“ another sphere than our own the working of Iron
“ began.”†

As to the great value of this primary ray from the light-realms of philology which the Rev. Basil H. Cooper has been among the earlier instruments to make public, there can be no question; but in respect of the conclusion he deduces as to the reason why that old word for “Iron” had such an extraordinary—shall we say hallowed—meaning, he has probably diverged from the truth as widely as the poles are asunder; but as we shall have to deal with some philological parts of this investigation hereafter, we refrain for the present from further noticing it, except by adding to what is here stated, that the error into which he has fallen is precisely the blood-relation of those of which Max Müller has been guilty, though it is to be hoped in each case unintended, and the direct

* See as to the erroneous nature of this conclusion the note, page 22, *ante*.

† See *ante* page 22, wherein it is shown that iron occurs “native” in three different conditions; also see *post* page 53, where evidence is led showing the impossibility of forging meteoric iron, by virtue of the presence of *Schreibersite*.

result of an unflinching faith in one special branch of research as sufficient for producing the necessary evidence for solving a problem. For how oft still is to be sounded in our ears, ere that we see it with our eyes, know it in our minds, and feel it in our hearts, that "To get at complete Truth, we must stand as 'near the centre as we can get of the 'Circle of the 'Sciences,' at which point the light rays, converging 'from the whole circumference, coalesce,'" instead of continuing to fix a station in that circumference from which we do not, as if we dared not, move—stuck right away from the fundamental bearing of things, as far off as possible from that illumined focus whereat the innumerable molecules of verity, as they are eliminated from error in approaching that sublime region, unite as into a solid jewel, dazing with the Light of Light itself?

That the hieroglyphic testimony, so far as we have barely touched upon it, is at one with the other evidence so far adduced, no one, we should suppose, would now dispute; and especially so, when we find that in Lower Egypt, in the very earliest times, the inhabitants worked so perfectly in granite, diorite, and others of the very hardest stones, for which Copper or Bronze tools would be useless. The result of this testimony is to add another link to the completion of that chain of evidence which in Lower Egypt pre-eminently proves the extremely high knowledge, strictly speaking, innate, as distinct from cultured Intellectuality, of man, in the earliest ages, which we are able with certainty to fathom—an Intellectuality in kind, indeed, so much nearer to that which, in man as at first proceed-

ing from his Maker's hands, was as distinct from knowledge acquired by culture, at the origin perfect and complete, even as, during the dark ages which followed, that of his successors, living further off from primeval times, was less perfect, less a true and really innate Intellectuality, and which became immeasurably more artificial, and retrograded from the Source of all genuine knowledge and power, so that according to a common view of our own time, which accepts the dictum of man's gradual evolution from the condition of a savage, an ignoramus, Egypt (with its civilisation matured even when it started, the centre of all known civilisation in the valley of the Nile, with language, painting, sculpture, architecture, agriculture, metal-working, and letters, all highly advanced at the very beginning) is an enigma which, on that doctrine, can never be solved. For the doctrine assumes precisely the reverse of what the evidence we find all over Oriental countries, as far as we have at present explored them, essays—namely, a highly cultivated beginning, with the arts, well-known and practised to an extent which in subsequent ages has never been approached, and from which there has not anywhere been discovered a gradual advancement, but, on the contrary, an immediate and decidedly progressive declension.

Yet whilst such is the state of fact, it is more than remarkable that the majority of Egyptologists and professors of Language-Science—who in many, probably in most cases, inverting what has appeared to others outside the special pale into which they have narrowed themselves, to be the true method of research into a remote past, through preferring, in short,

to explore the foundations of that past by the application backwards of theoretical notions which have been, with admittedly vast ingenuity, evolved in the present century, and dignified; too, with the name of Science—should until now almost have closed their eyes to the hard and solemnly-vocal relics, which others, endowed with a different order of vision, and possessed in some sort with not an ill-founded expectation of acquiring knowledge otherwise than from mere study of books—by the exercise, in short, of even their physical energies and the training of the eye to correct observation—have been permitted to bring to light. So that whilst we feel thus compelled to contrast the qualities of two separate bands of investigators, it will, we believe, be conceded as far from our wish to do injustice to anyone; nevertheless, as we are troubled neither with an expediency to please others, and have no end to serve in writing this book other than if possible to lift a shade higher the drapery which veils the past, so to gain a further glimpse of light, and where necessary to expose errors which have so authoritatively been flaunted in the face of mankind, it would probably be ill-becoming were we to shun pointing out that the Egyptologists, Assyriologists, and Language-Science professors, with one or two notable and laudable exceptions, are not the men who have either dug and delved, nor have they been eye-witnesses to those who, in a much more practical spirit of research, have dug and delved into the city-mounds, graveyards, or temple ruins of the East. Men most truly are they of literary knowledge in abundance—yet not acquainted with much of hand-

craft save pen-wielding—whose technic knowledge is scarce above zero, who, provided with the mere collections of European Museums (which in many cases, too, so many of these so-called authorities are proven, and when tested have to admit, to have but partially explored), are in most part occupied in poring over the mere books which have been made, through which, too, not a little of latter-day Teutonic mist, the result of an over-persistent following of book lore alone being bestrewed, has overshadowed the Truth as with November fog. Of such a class was the late distinguished though not enduringly renowned Chevalier Bunsen; and whilst by virtue of the refinement of decorum it has, in polished society, not improperly been decided as unseemly to speak of or contrast the dead disparagingly, or even hyper-critically, yet, as he with whose work we are bound to compare those conclusions as to illimitable ages preceding contemporary evidence of the appearance of Man as set out in “Egypt’s Place in Universal History” has, to the irreparable loss of genuine Egyptology, (which pursuit that other of whom we now have to speak followed out for years in Egypt itself), been also called from the Regions of Time, we may, without transgressing such polite rule of refinement, quote here the following passages from the “Monumental History of Egypt,” which to all who are acquainted with sterner fact, and not blinded with theory, must, we think, prove as assuring and refreshing as they are to us when stifled to-day with the dust so oft cast in our eyes.

Says then the late William Osburn:—“The arts of

“ sculpture and design in Egypt at the era immediately
 “ following” the first, second, and third dynasties of
 Memphis, “ were, as compared with subsequent eras,
 “ in a state of high, almost unapproachable, perfec-
 “ tion. This remark must be understood to refer to
 “ the *entire mass* of the monuments of the epoch.
 “ Wander where you will amid the desolate wastes of
 “ Ghizeh, and its vicinity, it is scarcely possible to
 “ select, from among the morsels of sculptured
 “ stones of which the mounds are all but com-
 “ posed, an example, the reliefs and hieroglyphs on
 “ which are not executed in the highest style of
 “ Egyptian art.

“ Ghizeh, and the rest of the cemetery of Memphis,
 “ struck me as having the advantage in this particular
 “ over every other large assemblage of the ruins of
 “ Ancient Egypt.”

“ By comparing together the remains of different
 “ epochs, it clearly appears that Egyptian art has had
 “ its periods of perfection, of decline, and of *renais-
 “ sance*, just the same as art in Greece and Italy. But
 “ we have no trace whatever of such beginnings, in
 “ these first productions of art in Egypt. It bursts
 “ upon us at once in the flower of its highest perfec-
 “ tion. Where, then, are the imperfect attempts,
 “ which issued in this perfection, to be found? No
 “ such have been discovered, either at Ghizeh, or in
 “ any other locality in Egypt; notwithstanding that
 “ (as we have explained), no work of man perishes
 “ there. This circumstance compels us to assume
 “ that *the skill of these primitive artists of Egypt was*
 “ *a portion of that civilisation which its first settlers*

"brought with them when they located themselves in the valley of the Nile.

"One other consideration will bring our inquiry home upon the point in discussion. It is indispensable to the continuance of art in perfection that the artists be kept in constant practice. If the demand for their productions fail but for a few years, a visible deterioration in their style is the certain consequence. Should this neglect of the arts continue for a single generation, art is lost. The skill, then, of the artists of Ghizeh, which they receive traditionally from the first settlers, must have been incessantly exercised during the entire interval of time that separated them from those first settlers. How otherwise could that skill possibly have been received from them? This is undeniably true: but if so, where are the artistic productions of the generations of men occupying the interval between the first settlers and the artists of Ghizeh? They are not to be found; and, as in the former instance, the present state of our knowledge of Egypt justifies us in concluding from thence that they have no existence. The inference is absolutely inevitable. The interval that separates the artists of Ghizeh from the first settlers in Egypt was but a brief one."*

Surely, then, in view of the facts which we do possess, it would become us more as men to sound them further, rather than pursue theories which, alas! have in these latter days come to be classed under the pseudonym of Science, and then to stand amazed because the facts, after all, do not fit such theories! Rather should we

* Monumental History of Egypt, vol. i. pp. 259-261.

remember the words of an Eastern sage of old, who, in censuring another, tendered that sound advice of caution in these memorable words—"Inquire, I pray thee, of the *former age*, and prepare thyself to the search of their fathers. For we are but of yesterday and know nothing, because our days upon earth are a shadow." *

* Job viii. 8, 9.

CHAPTER III.

WEIGHTIER TESTIMONY FROM EGYPT AS TO ARCHAIC
IRON-WORKING.

IN the former chapter we brought together a variety of evidence, contemporary with the instances noticed, proving that Iron, in one of its various states at least, was well known to, and used by, the most ancient nations of the world during the very earliest ages of which we have record. Further investigation of the subject has been productive in bringing to light additional and not unimportant evidence in this area of remotest antiquity.

The more extended our enquiries become concerning the state of some, at least, of the arts in ancient times, so have they always resulted in indicating an ever-increasing rise towards excellence in the ultimate product, in proportion as the examples cited belong to ages more remote from our own times. This assertion may doubtless be questioned by some; yet, as a point upon which those who have investigated high antiquity appear to be agreed, that just mentioned seems to stand out as settled. Many proofs of this may be found, but it is sufficient to signalise at present one or two—such as the Architecture and Sculpture of Proto-Egypt, Babylonia, Assyria, India, and Greece—which, it is well known, have never been

equalled in subsequent ages. That the artificers employed in executing the most ancient examples of mechanical work in Egypt were possessed of Iron tools (and, as we shall presently show, almost certainly Steel), the preceding chapter was, in part, directed to prove; and as indicating the belief prevalent in the Egyptian mind in later ages that Iron was used in Egypt in the earliest times, we may refer to Herodotus, who in his book—"Euterpe," ii. 125—describes the interpreter who read to him the inscription relating to the money spent on radishes, onions, and garlic for the workmen employed in the construction of the Great Pyramid, and who concludes by remarking how much more must have been paid for the *Iron, tools, fuel, and clothing*. We desire not to attach any undue weight to this statement of the "Father of History," but merely cite it to show that his mind at least had observed the necessity for concluding on the extremely early use of Iron—and we must remember, too, that his report is simply what he was told by an Egyptian of his own day, 450 B.C.

But not the least significant question naturally suggesting itself, as an outcome of the already mentioned fact, is, From what source was the Iron obtained? With regard to this question there has hitherto been some difficulty in accounting for the origin of the Iron so used by the Proto-Egyptian artificers; and failing better evidence, Mr. Basil Cooper, in his learned dissertation,* has, at the suggestion of Mr. Pengelly, been led, as we have already shown, to conclude in favour of "meteoric Iron;" Sir John Lubbock, too,

* *Trans. Devonshire Association*, 1868.

leaves room for that to be inferred from his researches in regard to some countries. In the preceding chapter it was pointed out that this explanation was scarcely well founded; and recent evidence of what is ascertained as to the existence of Iron in the Egyptian limestone renders such a conclusion still more improbable.

With respect to meteoric Iron having ever been employed in cases where it required to be forged into shape—as, for example, for knives, weapons, and implements of agriculture, &c.—the recently discovered, or more probably *re*-discovered, facts as to the impossibility of forging Iron of extra-terrestrial origin is strong evidence against the conclusions of those who are inclined to that view, and we here state the evidence given by Professor Thorpe, in December, 1872, before the Glasgow Philosophical Society on this point.

In speaking of the great improbability that the Iron of the ancients could have been of extra-terrestrial origin (meteoric Iron), Dr. Thorpe said—“ Even sup-
“ posing such Iron was formerly more abundant than
“ it now is, we have direct evidence to show that it
“ would be perfectly unfit for the purposes of Iron
“ manufacture. The experiment of forging such Iron
“ has been more than once tried, but without success.
“ The speaker instanced the remarkable attempts
“ recently made by Professor Mallet of Virginia,
“ U.S.A., the result of whose trials were exhibited
“ before the meeting of the Chemical Section of the
“ British Association at Brighton, in September, 1872.
“ These forgings were of a very imperfect character,
“ and so brittle that the greatest care was necessary
“ in handling them to avoid fracturing them. All

“ meteorites contain more or less nickel, cobalt, and
“ phosphorus: these elements appear to exist in union
“ in the meteorite, giving rise to a compound which
“ has received the name of Schreibersite. The pecu-
“ liar crystalline configurations which some meteorites
“ exhibit, known as Widmanstädt's figures, are in all
“ probability due to the dissemination of this com-
“ pound through their mass. It is well known that
“ any appreciable quantity of phosphates, and that
“ even traces of nickel and cobalt materially impair
“ the useful properties of Iron. Indeed, if the amounts
“ of these substances at all approach those present in
“ the majority of meteorites, the malleability and duc-
“ tility of the metal are destroyed. There is little
“ doubt that the impossibility of forging meteoric Iron
“ has arisen from the presence of these substances.
“ We must assume, therefore, that the chemical and
“ metallurgical knowledge of the ancients was far
“ more profound than ours, before we can believe
“ that they possessed the secret of working a char-
“ acter of metal that would be utterly useless to-day.”
To this Professor Thorpe has added in a note to the
writer—“ In conversation the other day with Professor
“ Bischof, he mentioned to me that some time ago
“ Professor Noeggerath, of Bonn, attempted to forge a
“ meteorite, but failed completely.”

It seems, however, to have been long known that
meteoric Iron could not be forged—for it is alleged
that Mohammed Seyd commanded a smith to make
of a lump of red-hot iron which fell, a sabre, a knife,
and a dagger, and that the workmen reported it not
malleable: *that it shivered in pieces*. Still, there appears

to be no difficulty in assigning a source for the Iron used by the ancient Egyptians; for a learned friend,* who has spent some time in Lower Egypt, assures us that the Iron of the limestone there, becomes washed out of the matrix, filters through and accumulates in hollow spaces or fissures, just as it does in South Africa on the eastern frontier of Cape Colony, where the Kaffirs, or more properly speaking, the Amakosas or Amapondas, have been famous from time immemorial for taking some of the flaky Ironstone formed as aforesaid, and, after heating it in little charcoal fires, with hammers and anvils of stone, beating out good malleable Iron heads for their "assegais." We are further informed that the late Colonel Dundas, R.A., sometime Superintendent of Woolwich Arsenal, had been among those Kaffirs, and seen them forge their "assegais"† heads in the manner above described. Besides, this Egyptian limestone may possibly have been treated in the fire at once, and so have directly yielded up the Iron it contained.

It is not, of course, presumed to assert that what obtains at Cape Colony in our own day is by any means a proof that the Proto-Egyptians adopted a similar course of manufacturing Iron when in posses-

* The Astronomer-Royal for Scotland.

† The "assegai" is between an arrow and a spear—a javelin for throwing by hand, consisting of a thin tapering shaft of wood or reed, and an Iron head, shaped thus, three to five inches long. Therewith the Kaffir kills his prey from a distance, and stabs his enemy close by; he also uses it as a knife to cut up a bullock for eating. The blades are said to have a slight skew on the central axis, to make the shaft rotate as it flies through the air. When the Kaffirs go out to fight, each man has a bundle of these Iron-headed assegais, with fine cutting blades too.



sion of like materials for doing so, but it is put forward not only as possible but much more probable than that meteoric Iron constituted the source from which they made their tools and weapons.

Whilst having had occasion to mention the native Iron-makers of Cape Colony, we cannot refrain from referring to the bearing of the evidence there obtained against the assumed law of an universal succession of Stone, Bronze, and Iron ages. If that be a law at all for any one country, it is certainly not a law for Cape Colony; for there are the savages now, never known to have worked Copper or Bronze, but who are nevertheless most excellent workers in Iron. This last-mentioned fact indeed stands out powerfully antagonistic to the conclusion arrived at by Mr. Tylor,* and who is quoted as his authority by Max Müller—namely, that “in New Zealand, where there is good Iron ore, “there was no knowledge of Iron previously to the “arrival of Europeans.”

It is, indeed, possibly true that the New Zealanders were unacquainted with Iron both at the arrival, and not improbably for unknown periods before the arrival, of Europeans—at which time they were found to be a degraded savage race, more beast-like than man-like—but the fact of the equally savage Amakosas or Amapondas being efficient workers in, and users of, Iron, proves that what we find so late as at the time of the European discovery of New Zealand is not a general law applicable to savage races. How intensely unwarrantable is it, then, to conclude that certain nations have for ever been isolated from all the rest of the

* Early History of Mankind, p. 167.

world—to stultify ourselves by concluding, in fact, that because the Greeks confined themselves in a hole and corner territory, extending from the Adriatic Sea to Asia Minor, it should be thought that all the rest of the world in olden time was equally isolated and isolating.

When we find, as assuredly there have been found, Phœnician inscriptions in Brazil, then it verily behoves us to pause ere we conclude upon the perpetual isolation of any race ; for, if from the countries usually typified as belonging to the Old World, the Phœnicians could sail down the Mediterranean, cross the Atlantic, or as the inscriptions themselves seem to indicate, sail from the Red Sea, make the Cape, or in either case descend from above the Tropic of Cancer as far south as the Tropic of Capricorn, which the Phœnician inscriptions in Brazil prove that some members of that race did in long past ages, a glance at a map will show that, on the other hand, it was not more difficult for perhaps even the Phœnicians, or some other enlightened and maritime race, to again sail down the Red Sea, cross the Indian Ocean, and set their foot either in Australia or New Zealand; and in both of which countries, in such a case, would Iron have become known and used by those remote colonists and planters there of the human race. Thus it will be seen that strong probabilities exist which make it impossible for reliance to be placed in any conclusion which is drawn from premises, one of which is the acceptance of the isolation of a race from its very beginning ; for the presence of the Phœnicians in Brazil at so remote a period proves that such a conclusion

cannot rest upon rigid law—a law which necessitates the assumption of endless independent creations of mankind in different regions of the earth—as against that doctrine, honoured both by tradition and religion, which accepts the original unity, or one creation, of mankind—and the spreading out of the race from a common centre in a remote age to people the earth, as the fact of the Phœnician inscriptions in Brazil testify, that in later times, and in those nearer to us, the human race continued to do. Such being the case, how can we again stultify ourselves by attempting to tell what proportion of that primeval high stock of knowledge, with which perfect man was at first endowed, the early maritime and colonising races carried and left behind them in the places of their settlement? Whence it follows that until the unknowns in this equation have their values assigned, it is impossible to evolve the ratio in which New Zealanders or other savage races, which admittedly throughout the historic period have been isolated, have retrograded.

As we have not as yet met with an account of the Phœnician inscriptions in Brazil published in Europe, we quote here from the *Evening Post*, an excellent Brazilian journal, the following extracts:—

“ PHŒNICIAN INSCRIPTIONS IN BRAZIL.

“ Readers of the *Evening Post* will recall a recent
“ allusion in these columns to the discovery of inscrip-
“ tions in Brazil, which, upon examination, proved to
“ be Phœnician,* and to record the presence there of a

* The instinct of the Phœnicians seems to have been to establish themselves everywhere on the islands and coasts. At an extremely early period they

“ Phœnician colony. The circumstances of the discovery are given as follows :—

“ Visconde de Sapercahy, a member of the Emperor’s Council of State, received, three months ago, a letter from Parahyba, enclosing a drawing of the inscription

held the Mediterranean—and not only there, but elsewhere, for long maintained a maritime supremacy. “Of writing, the Phœnicians,” says Dr. Farrar,* “were certainly among the earliest to perfect it, and the sole nation who made it widely known. . . . Nor is that all; for to the same remarkable people we owe some of the earliest enterprises of colonisation, and their adventurous barks, engaged in an active commerce, had carried them as far north as the British Isles, and as far west as the Sargasso Sea. . . . Unlike their national kindred (Semites), the Phœnicians were energetic; they were enterprising, they were artistic, they were grossly immoral, they were freely polytheistic. In short they were almost everything which the other Semites were not, and scarcely anything that the other Semites were.” And of this race he proceeds :—“If they were a pure race, they would go far (as do the Mexicans in America) to shake to its very foundations the conception of ineradicable race-distinctions which have long prevailed among so many ethnologists. The arguments against their being Semites is in part derived from the fact that the tenth chapter of Genesis classes them among the children of Ham. The supposition that this was a calumny of national hatred is, says Professor Munk, ‘a very convenient style of criticism, which emanates rather from a certain coquetry of scepticism, than from any desire to seek and know the truth.’ But in spite of this severe *dictum*, it must be admitted that, whatever may be the difficulties in the way of believing the Phœnicians to have been Semites, the difficulties on the other side are far more overwhelming. Professor Munk indeed, accepting a tradition of Herodotus, believes that *the Phœnicians were an immigrating, victorious Hamitic race*, who adopted the Semitic dialect of the Rephaim and other aborigines whom they conquered, and he thinks that Hamitic *débris* can still be discovered in the few monuments of their language. But can anything be more supremely improbable than the suggestion that such a people as the Phœnicians should have adopted their language from the defeated remnant of a race so brutal as the Palestinian aborigines—a race which, we may remark in passing, are not *certainly* known to have been Semites at all. One thing, however, is admitted on all hands, and that is that the Phœnician language, even if it had some slight extraneous admixtures, was not only Semitic, but bore the closest possible resemblance to the Hebrew. The names of their two chief towns, Tyre and Sidon, are both Hebrew, the former meaning ‘rock,’ the

* Families of Speech, 99 *et seq.*, 1873 edition.

“ upon a stone which the writer’s slaves had come
 “ upon during their agricultural labours on his farm,
 “ and which drawing had been taken by the writer’s
 “ son. This copy was turned over to the Historical
 “ Society of Rio, and by it to Senor Ladislao Netto,
 “ Director of the Rio Museum, for an examination.
 “ On examining it he found the letters to be Phœnician.

“ The inscription is of a commemorate stone—a
 “ rough monument erected by some Phœnicians of
 “ Sidonia, apparently between the ninth and tenth
 “ years of the reign of a king named Hiram. These

“ latter ‘fishery.’ *The relics of their language on coins and inscriptions* are very
 “ few, the most important being the inscription on the tomb of Eschmoun-
 “ Ezer, King of Sidon, which is now in the Louvre, and the Phœnician in-
 “ scription of Marseilles. But, on the other hand, we have several fragments
 “ of the language of the Carthaginians, who were their direct colonists, Dido,
 “ the legendary founder of Carthage, being, in all probability, a contempo-
 “ rary of the Phœnician princess Jezebel. We know that Carthage itself
 “ means in Hebrew, ‘Newton;’ that Byrsa, its citadel, is the Hebrew *bozra*,
 “ a fortress; that *bal* in such names as Hasdrubal and Hannibal is simply
 “ Baal; that Barca, the family name of Hannibal, is the same as *barak*,
 “ ‘lightning;’ that ‘suffetes,’ which Livy tells us was the name of the
 “ Carthaginian magistrates, is the Hebrew ‘shophetim,’ or judges; that
 “ Lilybæum, the name they give to the western angle of Sicily, means
 “ ‘towards Libya,’ *li* being simply the Hebrew preposition. Finally, not to
 “ dwell on other proofs, Plautus wrote a play called *Pœnulus*, ‘the Little
 “ ‘Carthaginian,’ and in that play a Punic scene is introduced, which, so far
 “ as it has been yet deciphered, is most distinctly Hebraic in its character.
 “ St. Augustine, who was himself a Carthaginian, says that Hebrew and
 “ Carthaginian differed but little. *Since, then, the Phœnicians spoke a Semitic*
 “ *language, we must necessarily conclude that they were themselves partially*
 “ *Semites.* Perhaps the true solution of the difficulties which meet us in
 “ finding them possessed of a civilisation wholly unlike that of the other
 “ people who spoke their language, lies in the fact indicated in the book of
 “ Genesis by the fraternal relation of Ham to Shem: perhaps, in fact, we
 “ may assume that there was at an early period a close intercourse and rapid
 “ interchange of relations between the descendants of Ham and those of
 “ Shem, and that, in consequence of this intercourse, the Hamites sometimes
 “ adopted the *language* of the Semites, while they retained tendencies and
 “ institutions of a wholly different character.”

“ rash and unfortunate Canaanites—the patronymic
“ which they have used to denominate themselves—
“ left the port of Aziongaber (now Akaba), a port
“ upon the Red Sea, and sailed for twelve novilunes
“ (lunar months) along the land of Egypt—that is,
“ Africa. The number of vessels they had and the
“ number of males and females composing the ad-
“ venturous expedition are all set forth in a concise
“ and seemingly elegant style, these particulars being
“ placed intermediate between the invocation—some
“ at the beginning and the others at the end of the
“ inscription of the Alonim Valonuth, that is, gods
“ and goddesses, or *superos superasque*, as is the Latin
“ translation of those well-known Phœnician words.
“ The inscription is in eight lines of most beautiful
“ Phœnician letters, but without separation of the
“ words, without the vowel points and without quies-
“ cent letters—three great obstacles to the interpre-
“ tation, to overcome which a mere knowledge of
“ Biblical Hebrew is insufficient.

“ Writing to the finder on the subject, Senor Netto
“ expresses the opinion that the voyage was made
“ during the reign of the second Hiram, who suc-
“ ceeded Solomon’s ally on the throne of Phœnicia.
“ He explains their crossing, of which they themselves
“ appeared to be unaware, by resort to Maury’s obser-
“ vations on oceanic currents. Like Cabrai, in fleeing
“ from the storms reigning from the Cape of Good
“ Hope up to near Senegambia, they steered in to
“ the high sea, and, seized by the famous equatorial
“ current, which sometimes flows with extraordinary
“ swiftness, they unexpectedly came upon the Bra-

“ zilian shores. Senor Netto writes to Ernest Renan
 “ and to Father Barges, giving them some words of
 “ his version, and asking their advice how to make
 “ his efforts of the most service to science.”

Whence, then, we may enquire, came it to pass that
 this inscription was made in Brazil, except by a people
 acquainted with the use of Iron-steel tools? or, as
 once exclaimed the hoary Job, “Graven with an Iron
 pen in the rock” (xix. 24).

To the preceding account of this inscription the fol-
 lowing may be added:—

“ ROCK INSCRIPTIONS IN BRAZIL.

“ The brief account of the discovery of Phœnician
 “ incriptions in Brazil printed yesterday is sufficient
 “ reason for directing the attention of scholars to the
 “ general importance of the subject. These rock in-
 “ scriptions in South America are peculiarly worthy
 “ of attention, because they seem to belong to a vast
 “ series, to the study of which Mentone on the Medi-
 “ terranean offers important contributions. M. de
 “ Bourbourg, in his ‘Quatre Lettres sur le Mexique,’
 “ points out the astonishing analogies between the
 “ myths of the ancient Mexicans and those of the
 “ Egyptians; and though the idea of an ethnological
 “ relation between the races has been regarded as
 “ very fanciful, it borrows singular confirmation from
 “ this recent discovery. It is now generally admitted
 “ that the red raspberry first passed from America
 “ into Asia by way of the north-west and returned by
 “ way of Europe, thus girdling the world; *and it may*
 “ *appear by-and-by that the American races, of several*
 “ *types, are identical with old-world stocks, or even that*

“ America was the best dwelling-place of the human
 “ race, as it is geologically the older world of the
 “ two. Brazil, for example, has, according to Mr.
 “ Hyde Clarke, of the London Anthropological Insti-
 “ tute, partaken of at least two great migrations. The
 “ Kiriri of Bahia are allied by language to the an-
 “ cient Pygmean or Negrito race; while the Guarani
 “ languages are allied to the Agua of the Nile region,
 “ the Avkhass of Caucasia, and probably to the antique
 “ Udes. The Mentone inscriptions probably belong to
 “ the same era. *These Phœnician remains render this*
 “ *early relation of the continents no longer a dream.*”

If, then, these Phœnician emigrations were made as late as the period of Solomon's ally, even then abundance of time has elapsed for the degradation of the colonist race from their comparatively elevated and dignified condition in Solomon's time (1015 to 975 B.C.) to that of beast-like savages such as they were found on Tasman's discovery of New Zealand in 1642. There are several parallel cases. Take as one, for example, the Egyptians in Solomon's time, or even as late as 600 B.C., when Iron was well known and used by them for agricultural implements, and behold the condition of the lazy, baksheesh-sucking, lying, and scum-like representative of his race pourtrayed in the native Egyptian of to-day. We meet the same parallel in Persia, India, Syria, Assyria, and Babylonia: the fact is too palpable to need the adduction of proof for its confirmation.

The difficulties in the way of deciding whether Iron was known to the Proto-Egyptians—to the race who erected in that country the earliest and most stu-

pendous edifices of any age, and which they continued to erect, but always in a retrograding order, so far as dimensions and excellence of workmanship are concerned, from the Delta southward, for about 1600 years—were insuperable until, in the first place, Col. Howard Vyse's Engineers removed, by blasting, from the oldest and largest building there, the piece of Iron now in the British Museum, and which is illustrated by Plate I.; and, in the second place, the reading of the hieroglyphs became so far advanced that it enabled the mention of that metal to be detected in some inscriptions belonging to the third dynasty of Memphis, to which we shall presently refer. Since the occasion when, nearly four years ago, the writer directed attention* to the existence of this very unique specimen of some primeval Oriental smith's handiwork, there have not been wanting those who have raised certain doubts respecting it—and these based partly on the difficulty of accounting for a sufficiently actual Egyptian source of Iron ore to produce the metal in the quantities in which it must have been required, if it is once granted that the early Egyptians knew of Iron, or even used it at all. The writer had certainly from the first held this difficulty in full view, and never felt satisfied regarding it until learning from Piazzi Smyth the fact of the existence of Iron in the Egyptian limestone, and the manner in which it accumulates in fissures, as already set forth.† Yet that answer to the difficulty, whilst deemed satisfactory at the time, sinks into insignificance when placed against the immensely extended

* Proc. Phil. Soc., Glasgow, vol. vii. p. 476; April 21, 1871.

† *Vide ante* p. 55. Also Proc. Phil. Soc. Glas., vol. viii. p. 236; Dec. 1872.

and incontrovertible proof since brought to light by Mr. Hartland. It is many years since Mr. Francis Galton found a black-looking slag, not unlike Iron slag, in some "exceedingly ancient Sinaitic remains, " conjectured to be anterior to the time of Moses,"* but it is only quite the other day that the import of this first step in a discovery received its due weight and was consummated by the finding of vast Iron-works by Mr. Hartland in the neighbourhood of that part of the Sinaitic peninsula which was held in subjugation by the kings of the third and fourth dynasties of the old empire reigning at Memphis, as proven by the monumental tablets in the Wady Meghara.

To this discovery we shall presently recur; but before dwelling upon it, it is important to point out more particularly than we have done in Chapter II. that the earlier discoveries of the mention of Iron in some of the earliest hieroglyphic tablets left it more or less probable that such allusions and references as are found in these lithic writings might at some future time be corroborated by the discovery of relics of the actual Egyptian Iron manufacture; and on the other hand, the finding of such remains is proof again that the hieroglyphic readings, even with the halos of uncertainty which, in respect of the metals, have until quite recently surrounded them, and which have been so fully acknowledged by Lepsius,† are, if not precisely so, at least very approximately correct.

At page 41, Chapter II. we mentioned that the

* Percy's Metallurgy, first Edition, p. 874.

† *Vide* "Die Metalle in den Ägyptischen Inschriften," Von C. R. Lepsius' aus den Abhandlungen der Königl. Akademie der Wissenschaften. Zu Berlin, 1871.







oldest known Egyptian word for Iron in one of the dialects was  Benipe; and that in another dialect the initial B is commuted to P, and the word becomes Penipe. On turning to the "Dictionary of "Hieroglyphs" by Dr. Birch, in Vol. V. of "Egypt's "Place in Universal History," we find, without any sufficient explanation, however, being given, by which an intelligible view of the position may be gathered, all the five following hieroglyphs, with the phonetic values marked for this one substance, in the order in which they are here set down:—

TABLE.

HIEROGLYPHS.	PHONETIC VALUE.	TRANSLATION.
	Ba.	Earth, Metal.
	Ba.	Iron.
	Baa.	Iron, Earth.
	Baāenepe.	Iron.
	Bet.	Iron.

Evidently, then, assuming for a moment that these phonetic values are correct as given by Dr. Birch, it may be said that the element "*Ba*" is a constant in the phonetic values which have been assigned to hieroglyphs translated as Iron; but this is a point leading into the more subtle intricacies of the Science

of Language, when truly and genuinely followed, the Egyptian "*Ba*" corresponding, it is believed, as we have already hinted,* to what we find in the *χαλκός* of Homer. Indeed, this view has been strengthened from a recent conversation with Dr. Birch, in which he informed the writer that, agreeing with Lepsius, he (Dr. Birch) considered the rendering and phonetic value of the hieroglyphic word for Iron to be still very uncertain. On November 6th, 1874, at the British Museum, Dr. Birch expressed to us his belief that the first syllable *Ba* was a general term signifying metal, and that any particular metal was denoted by the use of affixes signifying one or more of its qualities—for example, colour, such as white, black, yellow, etc.

Whilst, then, in the Sahidic dialect, which is said to be the oldest, we have the word *Benipe*, in another Egyptian dialect *Penipe* stands for Iron; or the initial B and P are commutable, this change corresponds to what we find in the Hebrew and Chaldee tongues, where, in the former we have *Barzel*, in the latter *Parzel*.†

Yet this question of difficulty as to the true hieroglyphic sign for Iron has been so openly stated by Lepsius that we mention here the results of that Egyptologist's commentary from his paper, "*Die Metalle in den Ægyptischen Inschriften*," published in the Transactions of the Royal Academy of Sciences, Berlin, contemporaneously with the writer's first communication to the Philosophical Society of Glasgow. Speaking at the commencement in terms somewhat general, and dealing with a variety of substances—not confining himself either at

* *Ante*, page 26.

† See Note page 41, *Ante*.

first to even a very early period—Lepsius leads up to what he has to say of Iron with the following remarks:—

“ The noble metals and precious stones were held
“ in great value, and considered of much importance
“ in ancient Egypt.

“ Metallurgy, as well as the art of cutting precious
“ stones, also the engraving of them, and their
“ application for numerous ornamental purposes, was
“ practised in early times, and that to a high degree
“ of perfection.

“ Glass-cutting was also practised, as well as the
“ colouring of glass in the molten or liquid state, so
“ as to imitate precious stones both in transparent
“ and non-transparent (opaque) masses. Working
“ with fused or molten substances and the vitrification
“ of substances was popularly known and generally
“ practised.

“ As to the variety of substances employed in the
“ arts of ancient Egypt, it is only necessary to glance
“ at the list of treasures which Thutmosis III. is repre-
“ sented in the Temple of Karnak as offering before
“ Ammon,* or at the riches in Gold and Silver which
“ the people of the South and of the North bring to
“ the King in the Tomb of Rekmara,† or of that
“ which the later King, Tutankamun, has brought
“ him by northern and southern ambassadors, as
“ depicted in Theban tombs.‡ Treasure in arms and
“ of all arts, including costly vessels, were kept by
“ Ramses III.—the rich Rhampsinitus of Herodotus,

* Champollion, *Mon.* pl. 316, 317.

† Hoskins' "Travels in Ethiopia," p. 328, pl. 46-49. Wilkinson's "Manners and Customs of the Ancient Egyptians," vol. i.

‡ "Denkmäler der Preussischen Expedition III.," 115, 118.

“ in his treasure house, as we are forcibly reminded
“ by the pictures in the rock-cut tombs.* According
“ to Rossellini,† they succeeded in making numerous
“ richly artistic vases in Gold and Silver, and of
“ elegant forms, with handles and covers, with figures
“ of men and animals, with decorations of flowers and
“ leaves richly and tastefully combined or intertwined,
“ and that in their original (? natural) colours.

“ To form a conception of the immense spoil in
“ precious minerals, both in the crude and worked
“ states, which were brought together in Egypt under
“ the Pharaohs of the Theban dynasties, from their
“ conquests in Asia and Ethiopia, it is necessary only
“ to examine the inscriptions on the wainscoating
“ about the front chambers of the Temple of Karnak,
“ describing the campaigns of Thutmosis III. from the
“ twenty-second to the forty-second year of his reign.
“ Similar records, too, were kept for the period of
“ Ramses II., as Tacitus reports it to have been
“ stated to Germanicus by the Theban priests.

“ They levied,” he says, “ unheard-of tribute from
“ the nations—great weights of Gold and Silver, and
“ numbers of arms and horses, besides gifts for the
“ Temples, ivory and odorous substances, abundance
“ of corn—in short, all the useful things which a
“ nation possessed—spoil, indeed, not less valuable
“ than that which the Roman power levied of the
“ Parthians.”


“ But even of later times we possess accounts of
“ rich booty in precious metals ; for instance, on the

* Champ. Mon. pl. 258-264. Rossellini, Mon. Civ. 59, 60-91.

† Rossellini, Mon. Civ. 58-62.

“ Ethiopian stele of Mount Barkal, and on the late
 “ monuments of the Ptolemies, and even from Roman
 “ times long lists of the places and countries are men-
 “ tioned which had to contribute certain metals and
 “ other precious minerals, arranged according to their
 “ value, to the temple treasures.

“ Considering the rich material for our knowledge,
 “ of the minerals known to and valued by the Egyp-
 “ tians; considering also the great progress hiero-
 “ glyphic deciphering has made in modern times, it
 “ is surprising that not only as to the designation of
 “ precious stones, but even of metals, so much uncer-
 “ tainty should prevail among Egyptologists.

“ The uncertainty proceeded in the first place from
 “ the sign which Champollion—and I do not know for
 “ what reason, others after him—held for a smelting-
 “ pot (crucible). He did not know the pronunciation
 “ of the sign, but translated it by *Iron*. Now it is
 “ generally read *Ba*, and considered by De Rougé to
 “ mean *Iron* or *Steel*; Birch* reads *Ba*, *Wood*, *Iron*, or
 “ *Brass*; Chabas† gives no pronunciation, but trans-
 “ lates ‘*bronze ou fer.*’ Brugsch wavers also between
 “ *Iron* and *ore*, or *metal*.‡ Dummichen§ renders the
 “ group  by ‘black metal.’

“ This hesitation between two so important metals
 “ as Copper and Iron is mainly to be explained by the
 “ fact, that, in the inscriptions, a fixed order (series)
 “ was found, in which a doubtful ideographic sign
 “ stood between two phonetic groups, of which that

* Bunsen's *Egypt*, vol. i., 2 ed., p. 555.

† Pap. Harris.

‡ “*Dictionary*,” pp. 23, 50, 91, 618, 751.

§ “*Recueil IV.*” 55, 56, 57, u. a. Text, p. 7.

“ which followed the sign sounded *taht*, and therefore
 “ corresponded to the Coptic $\tau\alpha\tau\tau$, *plumbum*, the pre-
 “ ceding sounding *mafka-t*, for which no correspond-
 “ ing word was found in Coptic. If, now, following
 “ Champollion, we take *mafka-t* for *Copper*, and the
 “ doubtful sign for *Iron*, everything seems settled; for
 “ then there is found Copper, Iron, Lead. With this
 “ order it appeared, however, not to correspond.

“ If the doubtful or unknown sign \mathfrak{D} however,
 “ were to be taken for Copper, Iron would be entirely
 “ wanting in the series, and another expression would
 “ have to be sought for *mafka*, which it would be diffi-
 “ cult to find. Brugsch* had indeed inferred from
 “ the fact that Macdonald had found turquoises dis-
 “ seminated in the rocks in the *Mafka* mines of the
 “ Sinaitic Peninsula, and had regularly worked the
 “ latter, that these turquoises had been the real aim
 “ of the very ancient mining colonies of the peninsula,
 “ and that *mafka* meant, therefore, not Copper, but
 “ turquoise; in which case the following sign \mathfrak{D}
 “ in the series of minerals would have been available
 “ for the meaning of Copper. This inference appeared
 “ to us all the more acceptable, as in the (fixed) series
 “ immediately after Gold and Silver, and before *mafka*,
 “ a mineral *chesbet* was inserted, which meant also,
 “ according to general interpretation, not a metal, but
 “ a precious stone, the *lapis lazuli*. Nevertheless,
 “ this conjecture that *mafka* was the turquoise, found
 “ little acceptance with Egyptologists, but is still
 “ retained by Brugsch in his dictionary.



* “ Ramblings to the Turquoise Mines and the Sinaitic Peninsula, 1866,”
 p. 80.

“ For these and other reasons therefore, the doubts
 “ as to the designations for *Copper* and *Iron* in hiero-
 “ glyphic inscriptions still continue. Since, now, other
 “ groups of metals also are not seldom found, which
 “ seem hitherto to have been generally mistaken, and
 “ since in the exploration of the Egyptian mineral series
 “ the important preparation of their colours also plays
 “ a great part, it appeared worth while to subject every-
 “ thing pertaining to this matter to a closer and con-
 “ nected investigation. This I have undertaken.”




“ There exists a natural order of the chief metals,
 “ arranged according to their qualities and according to
 “ their value as determined by their rarity and useful-
 “ ness. We generally divide the metals into precious
 “ ones, to which Gold and Silver belong, and base ones,
 “ like Copper, Iron, Lead. In the same way the metals
 “ followed each other with the Greeks and Romans; and
 “ with the Hebrews the same order occurs in the fourth
 “ book of Moses (Numbers xxxi., 22), where also tin (if
 “ the word *bedil* is thus to be translated) occurs—Gold,
 “ Silver, Ore (or Brass *), Iron, Tin, and Lead—only
 “ not unfrequently the Silver is put before Gold.

“ In such fixed order, the metals, as already men-
 “ tioned above, appear also in the hieroglyphic
 “ inscriptions, with one striking deviation, however.
 “ To wit, after Gold and Silver, there appears
 “ regularly, and that from ancient times down to
 “ Greek and Roman times, the mineral *chesbet*, or
 “ as it is generally written later, *chesteb*, and then
 “ the previously mentioned contested groups, which,

* Lepsius has the word “*Erz*” in the original German, which is variously translated as “Ore,” Brass, Metal, Metallic Vein, &c.

“ according to Champollion’s antecedent, are mostly
 “ explained by *Copper, Iron, and Lead*. There appear
 “ besides, now and then, still two groups , *asem*,
 “ and  *men*—of which the first is determined by
 “ the sign of Gold, the second by the unknown sign *D*.”

Passing over the lengthy discussion which Lepsius has undertaken in respect of the hieroglyphic signs relating to the precious metals and minerals, as having no immediate bearing on the branch of ancient metallurgy with which we are here particularly occupied, we come to that portion of his essay dealing with the baser metals; and we have to direct especial attention to those parts thereof relating especially to Iron in ancient Egypt, merely mentioning here the conclusions at which he has arrived—deeming this preferable to wearying our readers with the proof which Lepsius has chained together into a veritable *sea of hieroglyphs*. It may prove useful, then, to state in advance the outcome of his investigation, as expressed in his own words, viz.:—“ That Iron, however, was early known “ to the Egyptians, and commonly used by them, “ admits not of the least doubt.”*

Two other words occurring in the inscriptions—viz.,
,  *men*, and  *tehaset*, *tehseti* or *tehset*, and of which the following Coptic, German, Greek, and Latin equivalents are given by Lepsius—viz., “*πΙ ΒΕΝΙΝΕ*, das Eisen, der Stahl, *ἰσίδηρος*, ferrum”—have also presented some difficulty. The former of these

* Page 102 of the original paper.

hieroglyphic groups appears to be the older, and Lepsius thinks it equivalent to the *Ba* or *Be* in Benipe or Penipe—for, as he explains,* “the transition from “*m* to *b* repeatedly occurs in Egyptian.” Later on the word *tehset* appears to have supplanted *men*, and Lepsius says: “Whether the word *tehset*, which† had “sprung up in the meantime, was really identical with “*men*, and did not perhaps mean hardened Iron, “Steel, . . . cannot be decided now.” To which he adds: “This word also is undoubtedly “compound; and it may at least be mentioned “here, that the Egyptians, according to Plutarch (de “Iside et Orside, 26), called Iron ὀστέον Τυφῶνος—the “bones of Set (Typhon)—and that therefore *teh-set* “might, in its several parts, either really, or according “to a mystical interpretation, contain the name of “*Set* or *Seti*.”

As to the interpretation of the materials of which objects depicted in the inscriptions are made, by looking to the colours with which they have been painted, Lepsius has the following remarks, by which he shows how the materials may sometimes be mistaken, and indeed suggests that, in the transcribing and publication of the inscriptions, errors in this respect have sometimes occurred.

“There remains yet something to be said as to the “coloured representations on the monuments, from “which the use of Iron might be inferred. In the “representations of the tribute-treasures in the often- “mentioned tomb of *Rekmara* Iron does not occur, “which might be distinguishable either by name or by

* Page 109 of his essay.

† Ibid.

“ colour, neither does it occur among the gifts which
 “ were brought to King *Tutankamun*, neither is the
 “ name to be found among the treasures which are
 “ represented in the temple of *Medinet Habu*.

“ On the other hand there exist a number of very
 “ well preserved representations in tombs and temples,
 “ in which many utensils, and especially weapons, are
 “ delineated, whose colour unmistakeably proves the
 “ material of which they are made. The Egyptians
 “ had only a few, mostly very decided colours, among
 “ which they divided the innumerable shades of the
 “ natural colours. This often renders decision as to
 “ the material more difficult. Besides that the publi-
 “ cations of these are not always quite reliable, since
 “ copying at night time often causes not only blue and
 “ green but also other colours easily to be confounded ;
 “ and further so, since not unfrequently faded or other-
 “ wise destroyed colours in large pictures were restored
 “ by guess. This, however, does on the whole seldom
 “ prejudice critical examination. Gold and Silver are
 “ easily distinguished, where they are altogether to be
 “ recognised as metals, the former is painted yellow,
 “ the latter white. As certainly, however, the red or
 “ reddish brown Copper can be distinguished from *Iron*
 “ or *Steel*, since the latter is not, as we would perhaps
 “ prefer, painted grey but *blue*, which is also elsewhere
 “ as a rule substituted for grey. For smaller objects
 “ grey does not frequently occur, but even larger
 “ animals are mostly painted blue instead of grey, *e.g.*,
 “ fish with decidedly blue back, belly and fins white,
 “ yellow or reddish;* geese and herons blue;† dogs

* Rosellini Mon. Civ. 24, 25. † Ibid 7, 9.

“ in all colours, only not grey, yet occasionally blue ;*
 “ mice and cats reddish ; † the elephant also light red. ‡
 “ Only the donkey forms an exception. Water without
 “ exception is painted decidedly blue. For the varie-
 “ gated painted hieroglyphics grey colour is never used.
 “ It is therefore not to be wondered at if the mostly
 “ bright and water-coloured Iron was painted *blue*.
 “ If, therefore, on monuments we find the utensils
 “ and weapons painted now red now blue, we must
 “ assume that by this partly Copper and partly Iron
 “ was meant, and all the more so as hardened Iron so
 “ easily assumes a blue colour.

“ The war helmet of kings is always painted blue. §
 “ Its peculiar shape proves that it was made of metal ;
 “ the outside consisted of small steel rings, which
 “ covered easily and firmly the inner material, pro-
 “ bably leather like a coat of mail. The carriage of an
 “ Ethiopian king at the time of *Tutankamun* is yellow,
 “ therefore probably covered with Gold ; the wheels
 “ blue, therefore probably of Iron. In the tomb of
 “ *Ramses III.* the weapons and other riches of his
 “ treasure are represented, || among others blue swords
 “ with golden hilts ; war hatchets (battle axes) whose
 “ scooped out head of blue (therefore of Iron) is fixed
 “ to wooden handles. Wooden spears have alternately
 “ red and blue points, therefore of Copper or Iron.
 “ If dark blue is painted beside light blue, the
 “ former often looks greenish, and the old blue colour
 “ appears only by scratching the surface. I presume,
 “ therefore, that in some publications dark green has

* Rosellini Mon. Civ. 20, 7. † Ibid 14, 21, 2. ‡ Ibid 22.

§ Denkm iii. 115, and foll. || Rosellini Mon. Civ. 121. Chompoll. Mon. 262 foll.

“often been rendered instead of dark blue. For this reason I am inclined to take the alternatively red and dark green war helmets also as made of Copper or Iron. In the same way red and green daggers with golden handles alternate. The weapon Kops is painted with a blue Iron blade” (“which is in accordance with another reference in the essay to an Iron Kops in a tomb of Gurnah), yet the Gold of which the hilt consists runs up the concave back of the blade; the Iron was therefore either let into (sunk into) the Gold, or gilded on the back. In other cases the Kops of Kings was entirely of Gold, or like other swords entirely of brass.* In another similar weapon also Brass and Iron were blended in the blade.” †

After the foregoing, Lepsius adds :—

“Considering the frequent working (manipulation) of granite in large masses, which can be proved since the 4th Manethoic Dynasty, *it can not well be doubtful, that since that time, and indeed earlier, Iron and the hardening of it were known.* Still it is very remarkable, that in all the representations of the old empire, blue painted instruments can scarcely be traced.”

It is then eminently satisfactory to find the testimony of the first hieroglyphic scholar in Europe, after plodding through the interminable labyrinth of the inscriptions, concluding as he does, namely, that in the fourth dynasty, Iron undoubtedly was used. That is sufficient!! For be it repeated, that to the fourth

* Champ. pl. 15 to 11. † Ibid pl. 11.

dynasty only, and no further, as the earliest datum point, can we reach back into the depths of fact by contemporary monumental proof. It is true Lepsius admits that in that remote age it was used, but in small quantities only, and that when not necessary its place was supplanted by Copper, which is not improbable. So that if he even be right in the latter portion of his inference, it is clear again that in that very earliest age associated with contemporary monumental proof which human investigation can touch, man was not undergoing progressive evolution in the matter of the materials he used or the metals of which his tools were made; but, on the other hand, that each metal was adopted correspondingly with the high degree of knowledge and skill of the period, for the purpose for which it was best suited.

Before, however, that we pass out of the evidence which the inscriptions have afforded, and deal with the testimony of material relics, we have to allude again to the researches of the Rev. Basil Cooper, according to whom it seems to be proven that the sixth successor of Menes, or the seventh king of Egypt, bore in the royal oval or cartouche containing his name the very word "Benipe." His name was "Mibampes."

"Nine years ago," says the Rev. Mr. Cooper,*
"the name of this monarch was only known from
"Manetho and Eratosthenes, in both of whose lists
"of kings it appears in a more or less corrupted form.
"The royal oval or cartouche of this king does not

* *Antiquity of the Use of Metals, especially Iron, among the Egyptians*, page 18. Reprinted from the *Transactions of the Devonshire Association for the Advancement of Science, &c.*, 1868.

"appear in the tablet of Karnak, nor on the old
"tablet of Abydos, nor has it been detected on any
"isolated monument; but towards the end of 1864,
"when the tablets of Saqqara near ancient Memphis,
"and the new tablet of Abydos were published—the
"former having been discovered by Mariette Bey, and
"the latter by Herr Dummichen—this 'Iron King's'
"name was brought to light."

"On the tablet of Saqqara, or Memphis, which,
"like the old tablet of Abydos, belongs to the reign
"of Rameses the Great, say about the thirteenth
"century before the Christian era, the Iron King is
"actually the first of the fifty-six ancestors of Sesos-
"tris, whom the tablet originally comprised, and
"nearly all of whose escutcheons are still very well
"preserved. In the new Abydos tablet he stands
"sixth, one king being omitted in the interval, as we
"learn from the invaluable Hieratic Canon of the
"Pharaohs preserved in the Turin Museum, in which
"priceless document the discovery of the new tablets
"at once enabled Egyptologists easily to spell out
"the name, which had previously been undecipher-
"able. In all the three hieroglyphical records the
"name reads distinctly, 'Lover of Iron'—of course
"meaning, 'Lover of the Sword'—thus attesting

* This may possibly be one and a true rendering of the title, "Lover of Iron," but that it is the whole meaning involved under it, I think, may be seriously questioned, for we must remember that all art, and especially architecture, or the expression in material form or by sculptured symbol of all that was highest and deepest in man, could not receive such expression in well dressed and accurately finished stone, until the material for furnishing instruments for acting thereon was acquired; so that it is clear King Mibampes may well have been a "Lover of Iron," without necessarily being a warrior.
—St. J. V. D.

"not only the extreme antiquity of the use of Iron, but unfortunately also of that most dreadful evil of all which are the scourges of humanity—war."

But the evidence on behalf of early Iron-working in Egypt does not terminate with the mention thereof in the Inscriptions; for happily we possess other evidence, and that of a kind before which the still doubtfully interpreted hieroglyphic legend must sink into a second position.

We will now consider the important discoveries of Mr. Hartland, already alluded to. In the early part of 1873 Mr. Hartland described to the Society of Antiquaries his visit to Ayûn Mûsa (the Wells of Moses), by the Red Sea, the Wilderness of Sin, the lonely march of three days across the parched desert to the palm-tree groves of Wady Gherundel, and the defiles leading to Sinai. Mr. Hartland has built a house, in order to carry on his researches, near the junction of the Wady Kemeh, the Wady Mukattab, or the Written Valley and the Wady Meghara, and having taken some of the friendly tribes into his pay, has succeeded in discovering the old turquoise mines of the ancient Egyptians, the rocks that they worked for these stones, and it is said the very tools they used, also the places where they ground and polished these stones. This, however, is merely incidental, and but leading up to the other discovery, which is of so much importance to our subject; for, whilst investigating in other directions, Mr. Hartland has come upon the absolute remains of Iron-works. These works stand adjacent to the mines on some hills, at a place called Surabit-el-Khadur, and were constructed on the

Canaan system, in the opinion of their discoverer. The ore was very imperfectly extracted—slag brought over to this country, from the immense heaps that like mountains are piled around, contains as much as fifty-three per cent. of Iron. These works were commenced in very early times; each Pharaoh, as he continued them, added a large engraved stone, not unlike our tombstones, to state his work.* “It is to “be hoped,” remarks the author of the paper, describing this unique discovery, “that rubbings of “these stones may be sent to some of our skilled “readers of hieroglyphs, since much valuable historical information respecting the Egyptian metallurgy may have been by them preserved for our enlightenment, and to show how little the mind of “civilised man has developed during 3000 years.”†

It is further explained by the writer from whom we have quoted the preceding passage, that the district where this hitherto unequalled discovery has been made “has remained unexplored, probably on account of “its being off the beaten tract; and in an unknown “country there is no temptation to stray, particularly “as the guides and dragomen discourage any explorations which may add to the risk of the journey.”

Besides the ruins of these works and the enormous slag-heaps near them, there also exist the ruins of a temple and barracks for soldiers to protect them.

Yet what is more remarkable still, as opposing the modern North European theory of the succession of Stone, Bronze, and Iron ages, is the solid fact that in

* Vide “Proceedings, Soc. Antiq.,” Vol. v., 2nd Series, June, 1873.

† This should rather have been during more than 4000 years.—St. J. V. D.

this temple at the Sinaitic Ironworks, Mr. Hartland found Flint arrow-heads, which he has presented to the Society of Antiquaries, and which he describes as being the *earliest known specimens in the world*. It is, of course, possible that the discovery of Flint arrow-heads side by side with Iron is a mere coincidence, and that the two may be of a different age; but if a mere coincidence, it is not possible, under the circumstances of their being found not buried deep down in the earth, but in or among the very ruins of the barracks, that they are older than the barracks or Ironworks themselves: they may be coeval therewith, but it is not impossible, nay, it is extremely probable that they are relics belonging to some long subsequent age (in which, as we know to be the fact, the Egyptians had retrograded from their lofty initial standard of excellence in mechanical art), or that they may belong to some inferior foreign race who settled in or swept over the peninsula in a later period. The latter view has a strong probability of being true; for, judging from a parallel case, of a region which had been swept over or settled in by different successive populations, namely, as we learn from Dr. Schliemann's researches into the mound of Hissarlik,* whether that be the veritable site of the Ilion of Homer or not, the fact is undoubted, that whatever the ruins there covered may be, he finds four cities successively buried and built on one another, and in all of them Flint and Stone implements side by side with Copper, Bronze, and oxidised Iron in abundance; and notably in the fourth uppermost

* "Troy and its Remains." By Dr. Henry Schliemann. London, 1875.

or most recent stratum, where the Flint implements are most abundant, they are there associated with what his English editor describes as primitive wooden buildings, not found in the lower ruins, where everything, and especially architecture, teems with excellence. With respect to Iron in the Hissarlik remains, Schliemann rather significantly remarks—"The only objects of Iron which I found," excepting the sling bullets in the lower stratum, which have been analysed by M. Damour, "were a key of curious shape, and " a few arrows and nails close to the surface. From " Homer, we know that the Trojans also possessed " Iron as well as the metal which he calls *κύανος*, and " which, even in antiquity, was translated by *χάλυψ* " (Steel)." 'Steel, however, he does not appear to have found; yet Dr. Schliemann adds, "Articles of " Steel may have existed. I believe positively that " they did exist; but they have vanished without leaving a trace of their existence; for, as we know, Iron " and Steel become decomposed much more readily " than Copper"—and whilst we have made mention of the Hissarlik finds as representing almost, if not quite, a parallel to the association of Flint knives with the Sinaitic Iron-works, we have done so with the view of fairly interrogating every side of the question, so that others may discuss it at once from each point of view; yet we think that the weight of evidence will be allowed as decidedly in favour of the conclusion expressed by Mr. Hartland, viz., that the Flint implements of the Sinaitic Iron-works are the oldest relics of the kind yet found; and in the light of all circumstances involved, the probability is, that they

are as old as the Iron-works also, so that in any view of the case we have in Egypt Iron-works at least as ancient as the Flint arrowheads, and probably much more ancient. In this connection, we may further remark, that the Abbé Richard has pointed out the discovery of Flint implements in Egypt, Mount Sinai, Galgala, and in the tomb of Joshua * at Timnath-Serah in Mount Ephraim, from which it would seem almost certain that the Hebrew people, both when in

* Paper read before the British Association in Edinburgh, 1871, and in respect of which it may prove useful to quote the following from a recent French work, *La Terre*, by M. Pozzy :—

“ Ce fut au pied du Sinaï biblique, dit-il, que je trouvai le plus grand des
“ ateliers de silex que j’aie encore vu, avec les spécimens les plus remarquables
“ et surtout des pointes de flèches extrêmement fines. La plus jolie a été
“ trouvée dans l’Ouadi Férou, au centre même des montagnes sinaïtiques.

“ Vinrent ensuite plusieurs instruments trouvés, en Palestine, à Elbireh, à
“ Tibériade ; et entre le mont Thabor et le lac de Tibériade, sur un plateau
“ élevé de plus de 250 mètres au-dessus du Jourdain, dans un champ cultivé,
“ une hache semblable, quant à la nature du silex et à sa forme, à celles de la
“ Somme.

“ Mais les instruments qui méritent, je pense, la plus grande attention sont
“ ceux que j’ai trouvés sur le bord du Jourdain, à Galgal, lieu où, d’après la
“ Bible, Josué reçut l’ordre de Dieu de circoncire le peuple d’Israël, et dans le
“ tombeau que la science archéologique regarde aujourd’hui comme le tombeau
“ de Josué. J’ai trouvé ces instruments soit dans le tombeau même de Josué,
“ dans la chambre sépulcrale intérieure, soit dans le vestibule, mêlés à des
“ débris de poteries, à de la terre, etc.

“ J’en ai trouvé aussi dans le champ qui est devant le tombeau et jusque
“ sous un grand chêne vert éloigné de la tombe de Josué d’environ 70 à 80
“ mètres ; ils avaient été ainsi disséminés, quand on a fouillé et violé le
“ tombeau.

“ C’est la forme communément appelée *couteaux* qui domine dans ces
“ instruments ; quelques-uns, comme on peut s’en convaincre, sont encore très-
“ tranchants. Il y a cependant des scies, des pièces plates et arrondies, etc.
“ La plupart sont du silex ; il y en a aussi en calcaire blanchâtre qui semble
“ avoir passé au feu.

“ J’ai l’espoir, continue M. l’abbé Richard, que ces *instruments du tombeau*
“ de Josué et ceux dont j’ai parlé d’abord intéresseront les amateurs si nom-
“ breux et si éclairés de l’archéologie humaine que l’Association compte dans
“ son sein ; et en les soumettant à votre appréciation, je viens vous apporter

their wanderings in those lands, and after crossing the Jordan, who we know were familiar with the use of Iron, also used implements of Flint ; therefore, as the Sinaitic Iron-works now discovered lay right in their track, it is pretty nearly certain that the Flint arrow-heads brought home by Mr. Hartland, if they belong to a later date than the works themselves, are relics of the forty years' wanderings of the chosen race.

Further, we not only find from the Canonical books of the Hebrews that Iron was made in Egypt in the very period of the Israelitish wanderings, but on inspecting the contemporary monuments at Thebes,

“ non pas des idées préconçues, non pas des théories, mais des faits, de simples faits historiques et archéologiques.

“ C'est un fait historique que la fabrication de couteaux de pierre pour la circoncision des enfants d'Israël à Galgal, non loin du Jourdain. C'est un fait historique que le tombeau de Josué, élevé non loin de Sichem, longtemps oublié ou perdu, a été retrouvé, et que ses restes ont été vus et décrits par MM. de Saulcy, Guérin, etc. C'est un fait historique attesté par la version authentique des Septante qu'un certain nombre de couteaux de pierre de Galgal ont été projetés dans le tombeau de Josué, au moment de sa sépulture.

“ M. de Saulcy, dans son *Voyage en Palestine*, n'avait pas hésité à dire, dans sa confiance absolue au récit des Livres saints, que ces couteaux de pierre devaient exister encore dans le tombeau retrouvé de Josué. Mais l'abbé Moigno, mon illustre ami, dans son journal *les Mondes*, avait rappelé l'affirmation de M. de Saulcy, et m'avait vivement pressé d'aller, pendant que j'étais en Palestine chercher ces silex. J'y suis allé et je les ai trouvés. Quant aux conclusions que l'on peut tirer de mes instruments, aux arguments qu'ils peuvent apporter ou aux objections qu'ils fourniront contre les théories mises en avant par les diverses écoles anthropologiques ou biologiques modernes, je les laisse de côté.

“ Si mes silex historiques ressemblent à s'y méprendre, par leur nature et leur forme, aux silex que l'on veut être essentiellement *préhistoriques*, je pourrai le regretter, au point de vue des illusions que cette coïncidence peut faire évanouir, mais la vraie science doit accepter les faits, reconnaître l'identité des silex *préhistoriques* et des silex *historiques*."

“ Le 29 du même mois, M. l'abbé Richard présentait ses silex à l'Académie

belonging to the period (1500 B.C. or thereabouts), Sir Gardner Wilkinson* long ago discovered the picture of an actual Egyptian forge and bellows, just such as Dr. Percy has recently informed the writer, are used in Africa to-day, emblazoned on the walls of a tomb in the reign of Thothmes the third. See Fig. 4, which is copied from Sir Gardner Wilkinson's drawings, and to which attention has lately been again directed by Mr. Rodwell.† The ore and fuel together form the heap at the centre of the picture from which the burning flames are seen to issue. On either side of this heap the bellows are situated, consisting of flexible bags formed of the skins of animals, and each provided with a cord which the operator holds in his hands. From each of these flexible bags a tube proceeds into the heap of fuel and ore, and the blast is produced by the operator transferring the weight of his body alternately from one foot to

"des Sciences de Paris, et dans un compte rendu de cette séance paru au *"Moniteur universel* les mêmes faits ci-dessus relatés étaient reproduits.

"De ces faits il résulte, comme nous le disions tantôt, *que les âges de la pierre, du bronze et du fer n'ont pas toujours été successifs, mais quelquefois simultanés.* Il n'est pas douteux par exemple qu'à l'époque où l'officine de *"silex taillés* était en grande activité, au pied du Sinaï, l'usage du fer était depuis longtemps connu en Egypte. Quand, au pied de ce Sinaï, Dieu menace les enfants d'Israël, en disant: 'Si vous ne m'écoutez point, je ferai que le ciel sera pour vous comme de fer, et votre terre comme d'airain' (Lév. xxvi. 19), qui peut douter que l'usage du fer et de l'airain ne fût connu des Israélites? Quand, après une victoire sur les Madianites, Moïse dit que 'l'or, l'argent, l'airain, le fer, l'étain, le plomb . . . , sont purifiés par le feu' (Nomb. xxxi. 22); quand le livre de Josué parle des chariots de fer des Cananéens (Josué xvii. 16), n'est-il pas évident qu'on connaissait alors tous ces métaux? Quand, vers la même époque, Job nous dit 'que le fer se tire de la terre' (Job xxviii. 2); quand il s'écrie: 'Plût à Dieu que mes discours fussent gravés avec une touche de fer et avec du plomb, et qu'ils fussent taillés sur une pierre de roche à perpétuité!' (Job xix. 24) ne sommes-nous pas autorisé à tirer la même conclusion?"

* "Manners and Customs of the Ancient Egyptians."

† "Birth of Chemistry," p. 42. Macmillan & Co., London, 1874.

the other, thereby collapsing the bags and forcing the contained air through the tube into the burning and reducing heap. The bags are inflated by pulling up the upper part by the cord, this upper part having a hole or valve therein for allowing the air to enter, and which is closed by the heel of the operator on his again transferring his weight to it. Near the middle of the

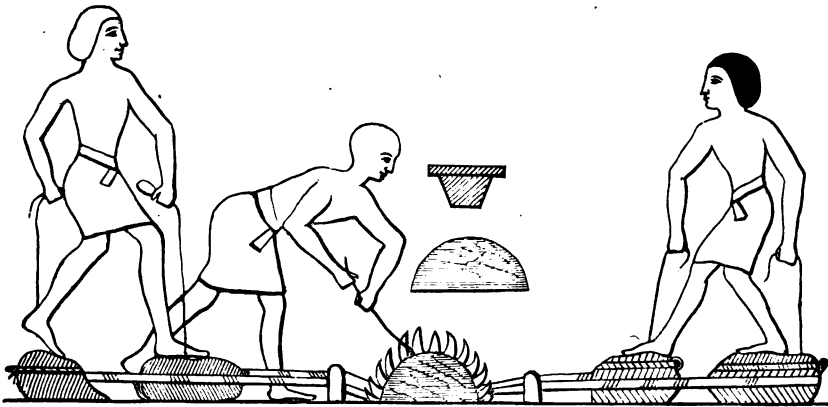


Fig. 4.

tomb picture there is represented an object which, judging from its shape, is probably a crucible, and another object below it is probably a heap of ore or fuel—this probability being strengthened by the fact of some Egyptian crucibles* of the same period being preserved in the British Museum.

Of what use, it may be asked, is it to adduce proof of Iron-working in Egypt six or seven hundred years later than the period when, judging from the monuments, its use was first and most seriously necessary? We reply, Of great use; for when we find at this later period the manufacture of Iron carried on side by side

* "Birth of Chemistry," p. 42.

with the use of Flint Implements, such is strong presumptive proof that both continued to be used side by side from the period of Egypt's first civilization, or at all events, since the work of constructing and erecting the monuments began; and as an indication that Flints were used in this period, and at the very place where the tomb picture of the forge has been found—viz., at Thebes—we quote the following:—*

“Mr. Ouvry exhibited a flint instrument picked up
“by himself on the Lybian hills above Thebes. It is
“of oval form, $5\frac{1}{4}$ inches long, and $2\frac{3}{4}$ inches wide, and
“more convex on one face than the other. It has been
“but roughly chipped out, though there is some
“secondary work along a portion of the side edges.
“Though entirely unpolished, there can be but little
“doubt of its belonging to the Neolithic period; and
“it was probably destined to be a sort of axe or adze.
“Polished stone hatchets or celts are of rare occurrence
“in Egypt, but the cutting end of one formed of nearly
“transparent quartz, and found in that country, is
“preserved in the Museum at Geneva. Finely chipped
“blades of flint from Egypt, some much resembling
“the large Scandinavian blades in character, and
“others with a lateral tang at one end for insertion in
“a haft are to be seen in the British Museum, and in
“the collections at Leyden, Berlin, and elsewhere.
“Long and well-formed flint-flakes have also been
“found in Egypt, some of them in a grave, to which
“Lepsius has found reason to assign a date of about
“2500 B.C. Those rudely chipped flakes, scrapers,
“&c., have of late years been found in considerable


* Proc. Soc. Antiq. Vol. v., 1874.

“ numbers by M. Arcelin and others. Some of them “ were associated with polished stone hatchets.”

To return. Far, indeed, is it from our wish to influence an over-estimate of the importance of this the latest of Egyptian “ finds ; ” but it seems to us very necessary, indeed, to point out that the discoverer and those who have already written on the discovery, place the age of these Iron-works at too low a date, and for this reason, that they happen to be in the actual neighbourhood in which have been found monuments at least contemporary with and by some computed to be older than the oldest of the pyramids—certainly as old as the fourth, if not the third dynasty of Memphis.

We allude to the celebrated Wady Meghara tablets* of the third and fourth dynasties ; whence it may be inferred as most probable that we are not far off from, if not actually at, the very source of the Iron and Steel from which the tools were formed to hew and dress the mighty stones of old Egypt’s mightiest and oldest monuments. Nay, and until some one shall prove to the contrary, that we have reached the actual forge whereat some primeval smith wrought that one alone known relic of pre-historic Iron-working which has descended to us—itself happily preserved in the

* The cartouches of the same kings are found in the rock tablets of Wady Meghara, as well as in the chambers of construction discovered by Colonel

Howard Vyse in the Great Pyramid, namely,  Shofu, and



nu-Shofu, and this fact is strong evidence of their contemporaneity.

treasure-chest of the Anglo-Saxon nation, the British Museum, and amongst all the contents of which there is nothing else which, when followed out *à fond* is capable of teaching a lesson so real, so contrasting—shall we say there is nothing else so *ironically* vocal from the ages of the old world?

There are, moreover, other facts which seem to render it certain that the foregoing inferences represent the true state of the case, and to which we now direct attention.

No fact is better known than that oft-repeated one, that the oldest architectural monuments in the world are the pyramids and tombs of Ghizeh. Another fact is equally well known, that the question as to how or by what instruments the not only large but intensely hard stones of some of these works were quarried, cut, and dressed into shape, with the exquisite finish we find them possessing in many cases, even now, has never been solved. There are no remains of Iron-works in the neighbourhood of Memphis or Ghizeh, nor in any part of Egypt, nor in the Sinaitic peninsula as yet discovered, other than those we have already alluded to in the neighbourhood of the Wady Meghara. From the tablets in this remarkable valley, we find undoubted evidence of a king of the third dynasty of Memphis at war with and subduing the inhabitants in the Eastern frontier of Egypt. His name was Sepsuris, and in the lists of Manetho he is the eighth king of the third dynasty, and the very earliest monarch respecting whom we possess contemporary evidence. His name (Fig. 5) occurs in an inscription over the doorway of a tomb at Ghizeh, which, the inscription tells

us, is that of his own son, whose death occurred in the lifetime of his father. This same name occurs again on a rock tablet in the Wady Meghara, as shown at Fig. 6, which is a copy from Lepsius. Sephuris is here accompanied, says Osburn, "by his standard or "title, "i.e., the great Horus (*Aroeris*), lord of "justice." . . . "It seems to have "been a war flag. The rock-inscribed "tablet whence we have extracted it repre- "sents Sephuris holding a foreigner by the "hair, and in the act of smiting him with a "club or mace. He is called 'SEPHURIS, the great god, "the subduer, conqueror of countries.' Like many of "his followers, Sephuris was called upon to defend the "Eastern frontier of Egypt against foreign aggres- "sion. He first recorded his successes on the rocks • "of this desolate valley, and they have followed his "example."*



Fig. 5.

Let us observe that, as belonging to the time before which Sephuris had vanquished his Eastern foes, Egypt has not yielded a certain trace of a single contemporary monument of any kind; that before his time all is traditional and absolutely devoid of collateral support, although we believe that it has been thought by some that the mention of Aches, the seventh king of the third dynasty, in a tomb at Abooseer, and which Rosellini also found in another tomb at Saqqara, render it probable that these may be a little older than the reign of Sephuris; but even allowing this full weight, it is trifling and unimportant in comparison

* "Monumental History of Egypt," Vol. I., 254-5.

with what we find occurring at Memphis after the conquests of Sepsuris in countries to the east of Egypt.

The oldest inscriptions are those in the Wady Meghara, in the very neighbourhood where the ruins of vast Iron-works have now been discovered by Mr. Hartland; and is it surprising, then, or rather is it not exactly what we should expect on *a priori* grounds, that there are no inscriptions nor monuments to be found until we come to the very time in which, and the site whereat the gravers, the chisels, and other instruments necessary to the inscribing and otherwise working in stone were manufactured, these being even depicted on the very oldest tablets (see Figs. 6 and 8 especially wherein just above the King's head, we see no other than a graver and a mallet depicted, the very tools essential to the production of inscriptions); and that so soon, immediately, in fact, that we come upon a source for such tools, then we find the rock inscriptions and built monuments, produced by their aid, in abundance, extending thence through all the active period of Egyptian history?

We have to remember, too, that the early colonists of Egypt came thither from Mesopotamia, a vast plain of sand, mud, and clay, where the buildings were erected of sun-dried bricks, and the necessity for Iron was on that account extremely limited as compared to that of another region wherein nature had provided the obdurate rock to be dealt with; also, that for the first two, and probably up to the seventh king of the third dynasty, the Mizraites confined themselves more or less closely to the banks of the

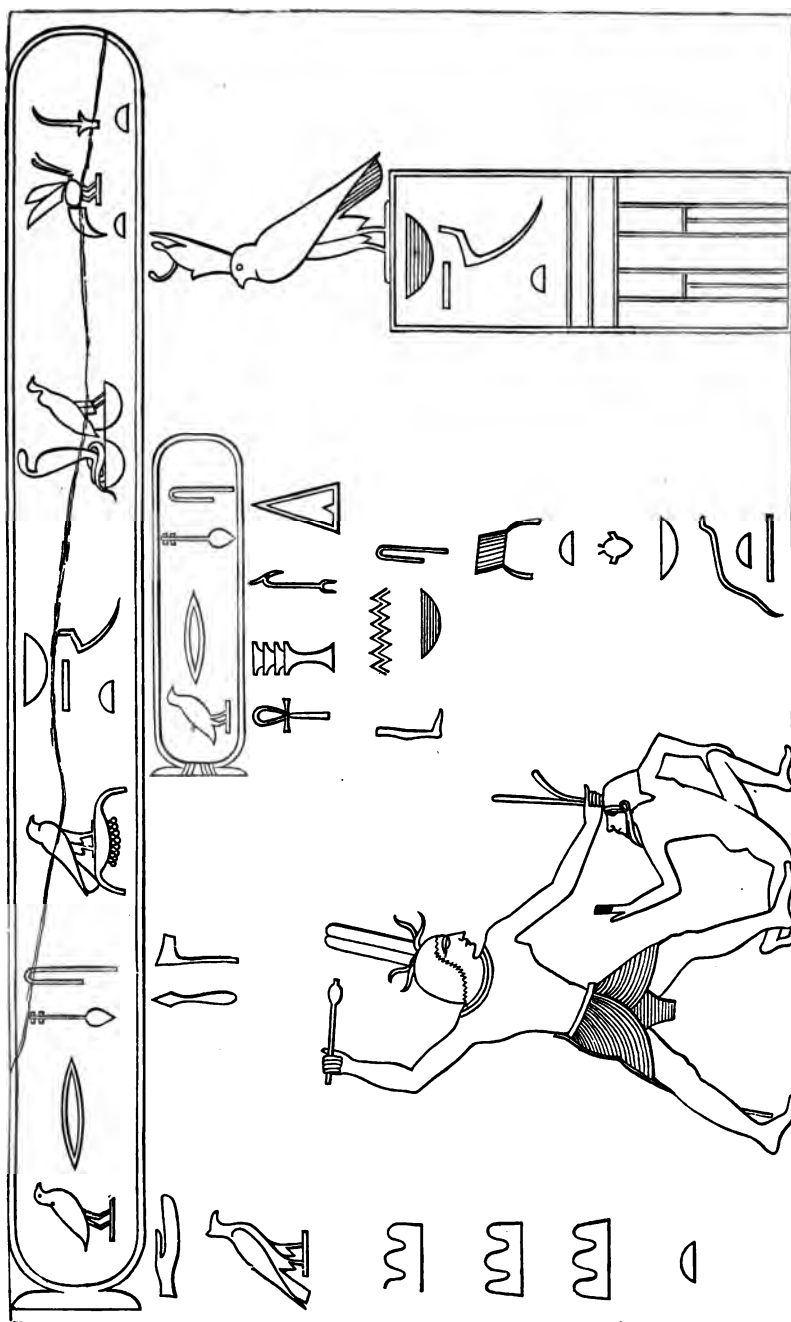


FIG. 6.—Sephuris at Wady Meghara (Oldest Rock Tablets). 3rd Dynasty.

Nile, at and about the Delta,* which is also of a Mesopotamian character, so that, as in their fatherland, these Mizraites during that period, and until they began to penetrate the country or were attacked by warlike neighbours, were not likely to feel the want of instruments or weapons of Iron, but in all probability continued to construct such temples or houses as were raised above the ground-level, of bricks dried in the sun and formed of the clayey mud of the Nile, as their forefathers had taught them in Shinar.

After the death of Sephuris the countries to the east of Egypt were still maintained under the yoke of the kings of Memphis. Accordingly, we find in the Wady Meghara a succession of rock-cut tablets, with the names of their successive Memphite kings, and the kings themselves depicted in the act of keeping the people in subjugation. Reference is now made to Fig. 7, respecting which we read—"Like his predecessor Sephuris, Soris had also to defend his north-eastern frontier against the desert rangers of Sinai." The subjoined tablet, Fig. 7, is inscribed on the barren crags of the Wady Meghara. It reads—" [HORUS] the hawk divine and great, the mace in all the lands of Monthra,† the subduer of all lands." The personage here discoursed of is the prince who

* It is, indeed, yet unproved that there were any actual buildings in Egypt constructed by native Egyptians until after the first Hyksos Invasion (commonly called the Shepherds), when that Shemitic community erected, or rather prevailed upon the monarch Shufu to erect, under their leader's superintendence, at the apex of the Delta the oldest building of all—the Great Pyramid. There was, however, plenty of excavation in the living rock, but nothing of architecture proper that we have yet ascertained.

† The God of War.

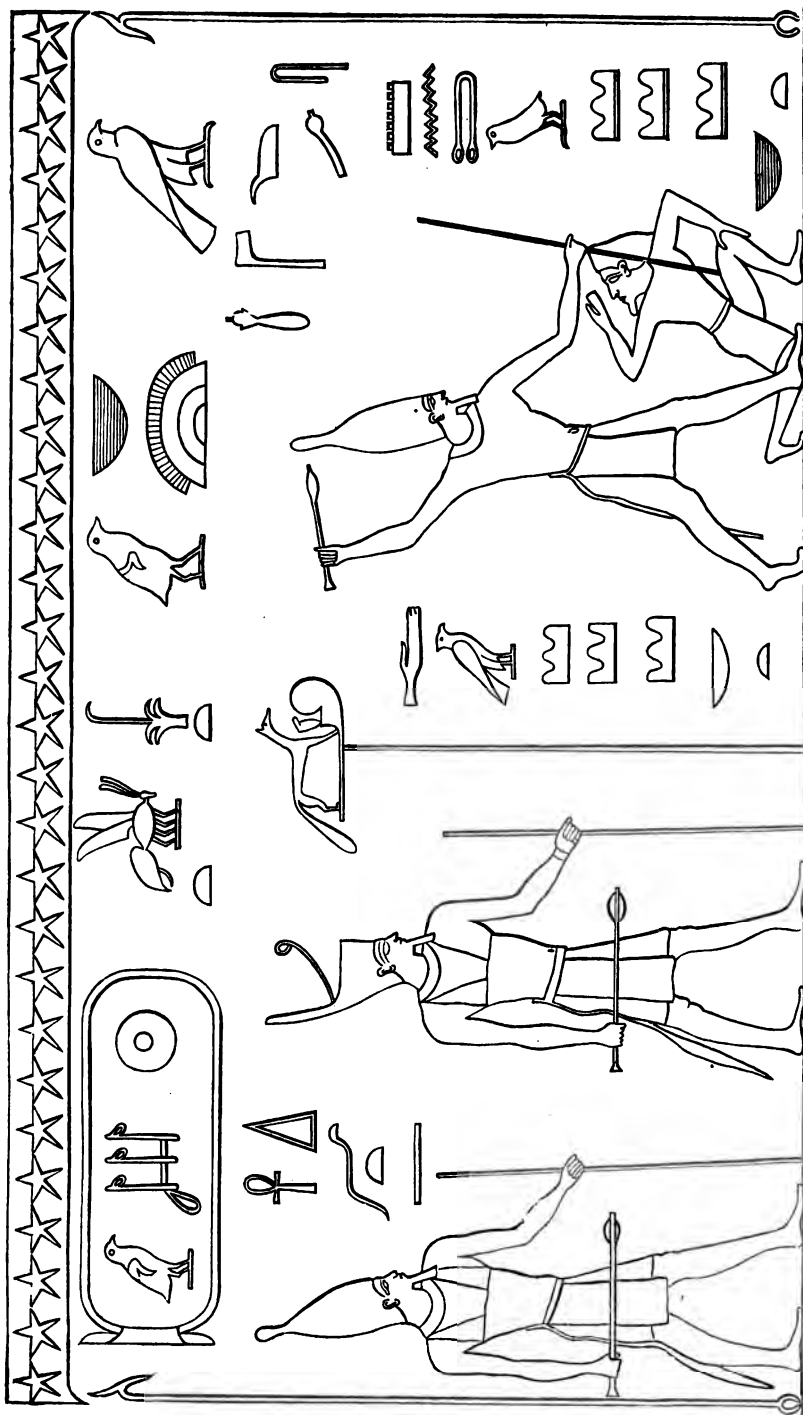


FIG. 7.—Soris and the Canaanites at Wady Meghara (Oldest Rock Tablets). 4th Dynasty.

holds his enemy by the hair, and smites him with the mace. This portion of the tablet refers to some military achievement accomplished in this neighbourhood by Soris when a prince. The rest of the tablet commemorates Soris as a king. It reads—"The lord of the festivals, King of Upper and Lower Egypt, Soris, ever-living." The two figures below represent Soris as King of Lower and Upper Egypt—*i. e.* of both banks of the Nile, in token of which dignities he wears the red and white portions of the *shent*. Immediately in front of him on a standard is the jackal, the symbol of vigilance. Above him are the starry heavens, supported by two sceptres, with the head of the Hoopoe, the symbol of purity.

That Soris reigned twenty-nine years, and that he was the first of a dynasty of Memphite kings, are the only particulars regarding him preserved in the lists.

Soris was succeeded by Suphis; and Fig. 8, also a rock tablet from Wady Meghara, represents him holding his enemy by the hair, and about to fell him with the weapon which he holds raised in the other hand.

Until the reign of Suphis there is no architectural monument to record—we mean in the sense of a built edifice; but in his reign and the co-regent reign of himself and his brother Nu-Shufu, we find ourselves suddenly confronted with the Great and Second Pyramids of Ghizeh; and whilst the existence of these, apart from any evidence of their actual growth from smaller and more imperfect preceding examples, has always been as great a puzzle to the inquirer as the solution of the question—By what means or tools the work of their construction was effected? we hope,

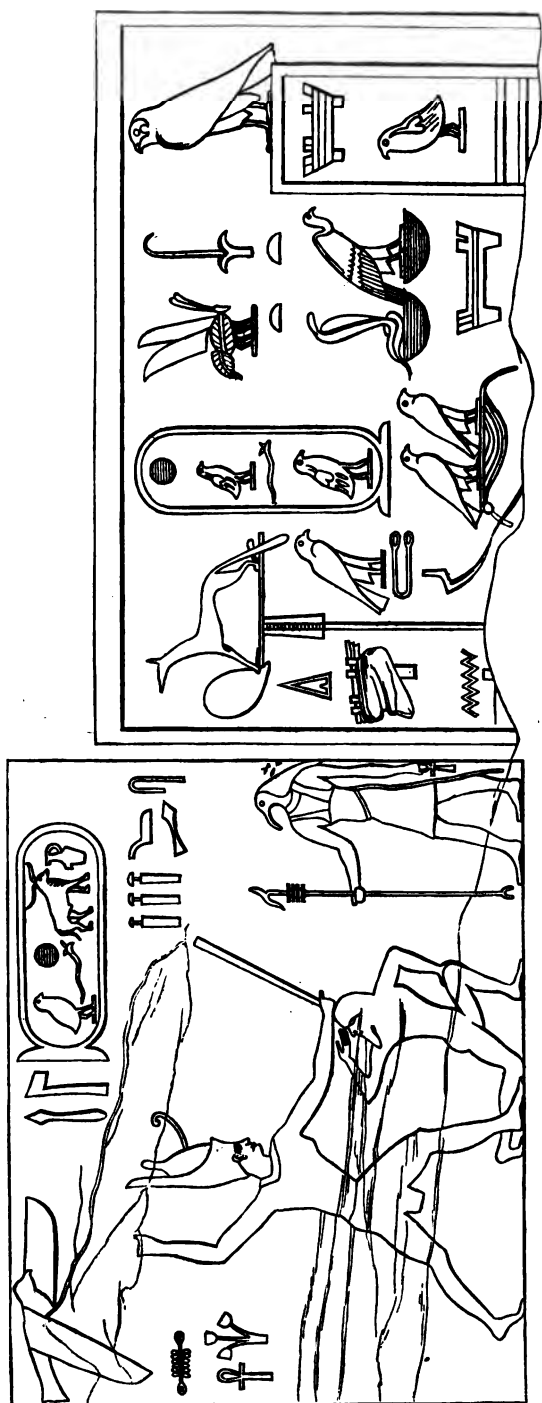


FIG. 8.—Tablet of Suphis and Nu-Suphis at Wady Meghara. 4th Dynasty.

at least, to have helped to clear the path of difficulty by having traced out almost to a certainty that Iron tools were supplied from the neighbourhood of Wady Meghara, which was held by the Memphite kings at the time the oldest monuments were erected; and the additional circumstance that they were held by force of conquest is not only testified to by the Meghara tablets themselves, but also by the existence of the ruins of a vast fortress in the neighbourhood of the Ironworks.

Since the evidence in favour of an extremely remote use for Iron in Egypt has come to light, and bearing in mind that the Greeks were acquainted with the manufacture of Steel, as described by Aristotle, some persons have even ventured so far as to suppose that the "find" of Col. Howard Vyse's Engineers may probably be Steel also. We must confess that when at first, at the recent Congress of Orientalists, held in London, this was suggested to us by Dr. Lepsius, we paid but little heed to it; but when he especially directed the writer's attention to the shape of the relic, blasted from the solid mass of the oldest Pyramid, and its appearance, pointing out the fact of its being somewhat thick along the middle and tapering off as if to an edge on either side, after the manner of a scraper, for finishing and finally levelling the outer faces of dressed stone, the writer became impressed with the force of that great Egyptologist's suggestion.

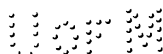
A familiarity with the accepted methods of testing metals naturally suggested to the writer that the question as to whether the relic was of Iron or Steel, might, with a close approximation to certainty, be tested, by

attempting to drill a hole in it, the relic, although much oxidised, being still for the most part in the metallic state. The conclusions to be drawn from such a test are, that if the drill easily and quickly penetrated the metal, then it must be Iron; that if, on the other hand, it resisted the action of the drill altogether, it was hard Steel; or if the drill penetrated but slowly, then it was probably softer Steel. The writer having explained the proof which such a test would afford in ascertaining the character of the relic to Mr. Bonomi and Dr. Lepsius, they prevailed on Dr. Birch to consent to the writer drilling a hole in it, and in the presence of those interested the test was made on the 18th of September, 1874, at the British Museum.

Having scraped off a little of the oxide near the thicker part of the fragment, the author commenced drilling, and finding that with a few rotations the drill easily penetrated the metal, he was at once convinced that it was soft Iron; the drilling was continued, but at the request of Dr. Birch the hole was not put through the Iron. The surfaces of the hole were examined, and had all the appearance of brightness and whiteness characteristic of newly-cut malleable Iron. To record the examination which has now been described, the following memorandum was drawn up by Dr. Birch, and signed by those who witnessed the test:—

“ BRITISH MUSEUM, 18th September, 1874.

“ An examination by drilling of the fragment found
“ near the channel of one of the air passages of the
“ Great Pyramid, in the excavations undertaken by
“ Colonel Howard Vyse.



“ It was found that the fragment was of Iron, the
“ drilling having penetrated it.

(Signed)	{	“ S. BIRCH. “ ST. JOHN V. DAY. “ R. LEPSIUS. “ CHAS. SEAGAR. “ J. BONOMI.”
----------	---	--

As the conclusive value, however, of a mechanical test may be called in question, it seemed desirable that it should be confirmed or negated by chemical evidence, and it was mentioned to Dr. Birch that a chemical analysis should also be made. On Dr. Birch's suggestion, the writer represented to the Trustees of the British Museum the importance of knowing the chemical constitution of the relic, and that body has responded to his representation by instructing Dr. Flight to analyse it. The following is Dr. Flight's statement of the result of his analysis:—

“ MINERAL DEPARTMENT, BRITISH MUSEUM,
12th May, 1875.

“ The result of my examination of the fragment of
“ Iron (? No. 3453) from the air-passage of the Great
“ Pyramid, goes to show that *it is not of meteoric origin*.
“ It contains, it is true, a trace of Nickel, but it is only
“ a trace. It is, in fact, by no means an uncommon
“ occurrence for a trace of that metal to be met with
“ in manufactured Iron, derived from its various ores;
“ and several analysts have detected the presence of
“ Nickel oxide in the ores likewise. According to
“ Pattison (*Brit. Assoc. Rep.*, 1864, p. 49) the Cleve-

“land Ironstone contains in 1 lb. of ore 0.72 grain of Nickel and 0.12 grain of Cobalt. O. L. Erdmann (*Jour. Prakt. Chem.*, xcvi. 120) states that he has many times found traces of Cobalt (the *alter ipse* of Nickel and constant associate of Nickel in meteoric Iron) in Iron ores, and still more frequently in samples of commercial Iron. It should be stated, by the way, that the presence of a trace of Cobalt is more readily recognised than the same amount of Nickel would be. C. O. Brann (*Zeit. Annl. Chem.* v. 226) mentions the fact that in many analyses of Iron which have been carried out in the Wiesbaden laboratory, the presence of Nickel and Cobalt has been recognised. G. Lippert (*Zeit. Annl. Chem.*, ii. 41) found in the Spiegeleisen, obtained from the Spathic Iron ore of Stahlberg, near Musen, 0.016 per cent. of Nickel and a trace of Cobalt.

“The fragment of Egyptian Iron contains combined carbon, an occurrence of great rarity in meteoric Iron. The locksmith who removed it from the specimen tells me that under the saw it behaves like Wrought Iron, and I find its magnetic character to accord with Wrought Iron rather than with Steel.

(Signed) “WALTER FLIGHT.”

With this, then, we conclude the evidence we have to lead in testimony of the use of Iron in the earliest period of Egypt's habitation.

CHAPTER IV.

BABYLONIAN, PROTO-CHALDEAN, ASSYRIAN,
AND HEBREW TESTIMONY.

AFTER having investigated the question of Iron and Steel in Ancient Egypt to the somewhat minute extent of the preceding chapter—viz., of proving its use there almost at, if not at, the very earliest traceable period of that country's habitation—it is probable that those who have concluded Egypt to be the country wherein high civilisation first prevailed will be satisfied; and the unsoundness of the Stone, Bronze, and Iron succession theory, as a thesis for general application to the whole world, being proved for this one country, such persons would probably deem it unnecessary, even as it might seem impossible, from the evidence we possess, to attempt to decide whether it be reliable even for any other. But then it happens that there is no general consensus that Egypt even is the cradle whence such remote civilisation first proceeded, although it is generally conceded, when looking fairly in face the character of the monuments which are found there of those early days, built in many cases of hardest and most intractable stone, that it really is the country wherein man first had the dire necessity for Iron and Steel tools impressed upon him. Nevertheless, recent researches into the Mesopotamian Plain, whilst not so far disclosing much (in comparison of what is found in the case of Proto-Egypt) as belong-

ing to the oldest Sumirian or Akkadian period, which appears to indicate the necessity for Iron and Steel wherewith to manipulate the materials with which the hand of man there seems to have dealt—these being generally soft and yielding, such as slimy clay, sand, and *terra cotta*; yet those who have conducted the latest researches among the buried sites of the mighty Interamnian region pronounce that “Babylonia, the “cradle of Semitic civilisation, stands prominent as “highly civilised and densely populated at a period “when Egypt was still in her *youthful* prime; * and further, that “it is quite uncertain how far back the “records of Babylonia reach, and the lists of kings “are too imperfect to construct any satisfactory scheme “from them; but *it is certain that they reach up to the “twenty-fourth century B.C., and some scholars are of “opinion that they stretch nearly two thousand years “beyond that time.*”† In another place‡ the author from whom we have last quoted, however, states that “no approximate date can be fixed for any Babylonian “monarch before Kara-indas, who reigned about B.C. “1475;”§ and again,|| that “all the great temples of “Babylonia were founded by the kings who preceded “the conquest by Hammurabi the King of the Kassi, “and the date of this conquest cannot be placed later “than the 16th century B.C. Bricks and *stone* tablets, “with *inscriptions* of these early Babylonian monarchs, “have been found at most of the sites, and the vast “size of their works shows their great power. The

* Trans. Soc. Bib. Arch., vol. I., page 5, address by Dr. Birch. 1872.

† “Assyrian Discoveries,” by George Smith, p. 447. 1875.

‡ Trans. Soc. Bib. Arch., vol. I., p. 31. 1872.

§ Since corrected to 1450. Vide *Assyrian Discoveries*, p. 442. || Ibid.

“civilisation of this early period is proved by the
“works on Geography, Astrology, Mythology, Gram-
“mar and Mathematics, &c., parts of which are
“inscribed on clay tablets in the British Museum.

“The civil administration and laws of the country
“are partly shown by a number of rule, loan, and law
“tablets belonging to the close of the period in ques-
“tion (about the time of Hammurabi); and the state
“of the fine arts can be estimated by the thousands of
“beautifully-engraved seals belonging to this age, now
“in various European museums.”

It would seem, then, judging from the inscribed stone tablets and the seals of Babylonia, that there was some need for hard metallic tools here also in the earliest period we know anything about; and Mr. Rodwell, the author of “The Birth of Chemistry,” recently writes us regarding these—“I cannot understand how these Babylonian gems, cut in hard
“Cornelian or Agate, could by any possibility have
“been engraved without the use of hard steel.” With such testimony, then, before us of the need for Iron and Steel in the remotest times in Babylonia, and especially now that the authorities assert that to be so remote—more ancient than Egypt—it is worth while—nay, it is imperative—that the testimony which this old Interamnian habitation has to afford should be sifted; and to this we proceed.

By this other very ancient nation, then—namely, that composed of the Akkadian and Sumirian races—we have proof that Iron was used; for although it cannot be said that any actual examples have come down to us which can unhesitatingly be pronounced as

belonging to the earliest Akkadian or Sumirian age, yet that is not remarkable when we remember the quickly-oxidising character of this metal, in comparison with Copper, Silver, Gold, &c.

The alluvial plain extending from the Persian Gulf and included between the Euphrates and Tigris, as far north as Hit (Is) on the former and a little below Samarah on the latter, and generally supposed to be that first occupied by man after the Deluge; this being not only affirmed by the Hebrew Scriptures, but generally allowed also, is what we have now to deal with.

The Rev. Henry Rawlinson, in his "Five Great Monarchies," vol. i., pages 98, 99, says, in reference to the metallurgy of the Chaldeans, "Metal seems to be scarce, and not many kinds are found; there is no Silver, Zinc, or Platinum, but only Gold, Copper, Tin, Lead, and *Iron*." . . . "Iron, as already observed, is extremely uncommon, and, when it occurs, is chiefly used for the rings and bangles which seem to have been the favourite adornment of the people." There are several such Iron and Bronze rings in the British Museum, and, having made an examination of them, we are disposed to differ from the conclusion which Rawlinson arrives at, namely, that these rings were all for purposes of ornament. We are inclined to agree with Col. Pearse, who pointed out to the writer the similarity which they bear to the rings of the chains by which the battering-rams of a later period are shown as suspended in some of the bas-relief at the British Museum. (See in particular the bas-reliefs in the British Museum repre-

senting the siege of a city by Assur-nazir-pal, about B.C. 880.) As rigid rings, it is impossible that they could have been used for armlets and anklets; and the considerable extent with which the ends of the curled-up bars of which they are composed overlap each other, is strong though not absolutely conclusive evidence that they constituted links of chains, which were coupled together by springing open the overlap, and passing the ring therethrough. When, however, we do find relics of Iron manufacture among the ruins of the Chaldean kingdom, which had its period of chief activity and importance between 2000 and 1500 B.C., few though they be, and these very few doubtless belonging to a large number of original examples, lost through oxidation—coming down to us now in tangible form—we are led to infer that these, such as they are, have reached us owing to some peculiarities of position, which have ensured their dryness, or otherwise interfered with that natural tendency to rapidity of oxidation attaching to Iron; and hereafter we shall find philological evidence proving the knowledge of *Iron* to the earliest ascertained branch of the Akkadian race. Iron indeed appears to be mentioned in the earliest Chaldean or Akkadian Inscriptions, and is rendered *Hurru*d by Rawlinson.*

After the decay of the Proto-Chaldean kingdom, when the seat of Mesopotamian empire moved north-westward up the Tigris, and the Assyrians flourished—*i.e.*, from about B.C. 1600 to B.C. 625—we find them also as workers and users of Iron—on which the following testimony of Mr. Layard is conclusive.

* Vide *post.*, p. 118, *et. seq.*

Speaking of the "finds" in the north-west palace of Nimroud (the ancient Calah), he says : * "As we approached the floor (*i.e.*, of Chamber 1), a large quantity of Iron was found amongst the rubbish, and I soon recognised in it the scales of the armour represented on the sculptures. Each scale was separate and of Iron, from two to three inches in length, rounded at one end and square at the other, with a raised or embossed line in the centre. The Iron was covered with rust. . . . As the earth was removed, other portions of armour were found, some of Copper, others of Iron, and others of Iron inlaid with Copper. At length a perfect helmet (representing in shape and in the ornaments the pointed helmet represented in the bas-reliefs) was discovered.† When first separated from the earth it was perfect, but immediately fell to pieces. I carefully collected and preserved the fragments, which were sent to England. The lines which are

* "Nineveh and its Remains," vol. i., p. 341, *et. seq.*

† With respect to these helmets, they appear to have been of exquisite workmanship. Rawlinson has pictured one of them, from Koyunjik (Nineveh), in his "Five Great Monarchies," vol. i. page 441, and regarding which he says—"The pointed helmet admitted but of few varieties. In its simplest form it was a plain conical casque, with one or two rings round the base, and generally with a half disk in front, directly over the forehead. Sometimes, however, there was appended to it a falling curtain crossed with metal scales, whereby the chin, neck, ear, and back of the head were protected. More often it had in lieu of this effectual but cumbrous guard, a mere lappet or cheek-piece, consisting of a plate of metal attached to the rim, which descended over the ears in the form of a half-oval or semicircle. If we may judge of the remains actually found, the chief material of the helmet was Iron. Copper was used only for the rings and the half-disk in front, which were inlaid into the harder metal."

Another helmet in the British Museum, which I have had photographed, appears to me on examination to be entirely of Iron or Steel, and is an exquisite piece of metallurgic art.—*Sr. J. V. D.*

“ seen round the lower part of the pointed helmets in
 “ the sculptures are thin strips of Copper inlaid in
 “ the Iron. Several helmets of other shapes, some
 “ with the arched crest, were also uncovered, but they
 “ fell to pieces as soon as exposed ; and I was only
 “ able, with the greatest care, to gather up a few of
 “ the fragments which still held together, for the
 “ Iron was in so complete a state of decomposition
 “ that it crumbled away on being touched.” Layard
 again says that “ circuitous *Iron* caps, fitting closely
 “ to the head, were also in use at an early period.
 “ The horseman who leads the horse of the warrior
 “ in a bas-relief from the most ancient palace at
 “ Nimroud, is represented with this head-dress.” *

In regard to these quotations, it is almost unnecessary to remark that the correspondence of the armour structurally with that shown in the bas-reliefs, is as sure a proof as we can expect ever to come across of the contemporaneousness of both ; and, holding in view that special structural character, it shows that the Assyrians, in the early period of their history, were possessed of very considerable proficiency in the execution of complex Iron-work—requiring, too, very excellent Iron to submit to the various contortions and strains inherent to the shaping it as armour for the human body.

One of the sources from which the Assyrians obtained this Iron was most probably the Tiyari mountains. Mr. Layard, in regard to the metallic deposits there, says†—“ In the Tiyari mountains, particularly in the

* “ Nineveh and its Remains,” vol. ii., p. 339.

† *Ibid.*, vol. i., pp. 223, 224, 6th ed. 1854.

“ heights above Lizan, and in the valley of Berwari, “ mines of *Iron*, Lead, Copper, and other minerals “ abound. Both the Kurds and the Chaldeans make “ their own weapons and implements of agriculture, “ . . . collecting the ores, which are scattered in “ the declivities or brought down by torrents.” Further on he remarks* —“ Their mountains furnished a variety of minerals—Silver, *Iron*, Copper, “ and Lead, and perhaps even Gold.” “ *Iron*, the “ most useful of all the metals, WAS THE ONE WHICH “ MOST ABOUNDED, and which could most easily be “ procured, as soon as the process of extracting it “ from the ore was known. I have observed that it “ is found in great quantities, scattered on the sides “ of mountains, three or four days’ journey from “ Mosul. Amongst the objects of tribute enumerated “ in the Statistical Table of Karnak, *Iron* is mentioned as brought to the Egyptians almost exclusively by the inhabitants either of Assyria, Persia, “ or of the countries immediately adjacent, by the “ Tahai, the Rutenu, and the Asi. It was generally “ exported in the form of bricks or pigs, but also “ occasionally in the ore.”

In his other work,† Layard speaks still more assuredly as to the degree of skill acquired by, and the extent to which Iron was used by the Assyrians, thus‡ :—“ It would appear that the Assyrians were “ unable to give elegant forms or a pleasing appearance “ to objects in Iron alone, and that consequently they “ frequently overlaid that metal with Bronze, either

* *Ibid*, vol. ii, p. 415, 6th ed., 1854.

† “ Nineveh and Babylon.”

‡ p. 191 *et. seq.* London, 1853.

“entirely or partially by way of ornament. Numerous
 “interesting specimens of this nature are included in
 “the collection of the British Museum.” “The feet
 “of certain tripod stands † found at Nimroud—these

† Speaking of one of these, Dr. Percy says :---“ This was a very remarkable
 “specimen. It was a small casting, in the shape of the fore-leg of a bull.
 “It formed the foot of a stand, consisting of a ring of Iron, resting on three
 “feet of Bronze. It was deeply corroded in places, and posteriorly was
 “fissured at the upper part. A section was made, which disclosed a central
 “piece of Iron, over which the Bronze had been cast. At the upper part,
 “where it had been broken off, the Iron had rusted, and so produced the
 “crack above mentioned. The casting was sound, and the contact perfect
 “between the Iron and surrounding Bronze. It was evident on inspection
 “that the Bronze had been cast round the Iron, and that the Iron had not
 “been let into the Bronze; and in this opinion I am confirmed by Mr.
 “Robinson of Pimlico, who has had considerable experience in Bronze
 “casting.

		Composition.
Copper,	.	88·37
Tin,	.	11·33
		<hr/> 99·70

“Some interesting considerations are suggested by this specimen. The Iron
 “was employed either to economize the Bronze, for the purpose of ornament,
 “or because it was required in the construction. If the former, Iron must
 “have been much cheaper than Bronze, and, therefore, probably more
 “abundant than has been generally supposed. No satisfactory conclusion
 “can be arrived at on this point from the fact, that Bronze antiquities are
 “much more frequently found than those of Iron; for the obvious reason,
 “that Bronze resists, much better than Iron, destruction by oxidation.
 “Although I think there are reasons for supposing that Iron was more
 “extensively used by the ancients than seems to be generally admitted, yet,
 “in the specimens in question, it appears to me most probable, that the Iron
 “was used because it was required in the construction. And if this be so,
 “the Assyrians teach a lesson to many of our modern architects and others,
 “who certainly do not always employ metals *in accordance with their special*
 “*properties*. The instrument under consideration, it will be borne in mind,
 “was one of the feet of a stand composed of an Iron ring resting upon vertical
 “legs of Bronze. A stand of this kind must have been designed to support
 “weight, probably a large cauldron; and it is plain that the ring portion
 “should therefore be made of the metal having the greatest *tenacity*, and
 “the legs of metal adapted to sustain *vertical or superincumbent weight*.
 “Now, this combination of Iron and Bronze exactly fulfils the conditions

“consisting of a circular ring raised upon feet, to hold jars and vases—are frequently represented on the bas-reliefs, as shown in M. Botta’s large work.” “The ring was of Iron, bound in some places with Copper, and the feet, partly of Iron, and partly of Bronze, ingeniously cast over it;” * whilst “the Iron enclosed within the Copper has not been exposed to the same decay as that detached from it, and will still take a polish.” † Then, concerning the nationality to which the artificers of these specimens belong, Layard suggests:—“From the Egyptian character of the designs, . . . it may be inferred that some of them were not Assyrian, but had been brought from a foreign people,” who, he appears, and very satisfactorily, to conclude, were the Tsidonians and other inhabitants of the Phœnician coast, the most renowned workers in metal in the ancient world, and whose intermediate position between the two great nations, he considers, may have been the cause of the existence of a mixed art among them. Of the other “finds” at Nimroud, Layard mentions many in Iron. For example, he says:—“Around the vessels I have described were heaped arms, remains

“required. I do not say that a ring of Bronze might not have been made sufficiently strong to answer the purpose of the ring of Iron; but I do say that, in that part of the instrument, Iron is more fitly employed than Bronze. Moreover, the contrast of the two metals, Iron and Bronze, may also have been regarded as ornamental.” With respect to the Iron portion of this relic, Dr. Percy says: *—“I have recently examined the Iron of the core, and found that it does not become sensibly harder by plunging it while red hot into mercury,” which, it may be added, is evidence that the specimen is not possessed of steely properties!

* “Nineveh and Babylon,” p. 178.

† *Ibid*, 191.

* “Iron and Steel,” by John Percy, M.D., F.R.S. p. 875. 1864.

"of armour, *Iron Instruments*."* . . . "The
 "arms consisted of swords, daggers, shields, and the
 "heads of spears and arrows, which, being chiefly of
 "*Iron*, fell to pieces almost as soon as exposed to the
 "air. A few specimens have alone been preserved,
 "including the head of a weapon resembling a trident,
 "and the handles of some of the swords."† . . .
 Speaking of the Bronze shields found also at Nimroud,
 Layard says, "the handles are of *Iron*."‡ Again,
 he mentions that "a number of thin *Iron* rods, §
 "adhering together in bundles, were found amongst
 "the arms. They may have been the shafts of
 "arrows;" || and of arrow heads, he tells us "that
 "several such barbs, both of *Iron* and *Bronze*, have
 "been found in *Assyrian* and *Babylonian* ruins, and
 "are preserved in the *British Museum*," ¶ at which
 repository there also exists the *Iron* head of a spear
 from Nimroud; whilst as the crowning point to the
 discussions bearing on the ancient use of *Iron*, he
 adds—"Amongst the *Iron* instruments were the head
 "of a pick, a double-handled saw (about 3 feet 8
 "inches in length, by 4½ inches broad), several objects
 "resembling the heads of sledge-hammers, and a large
 "blunt spear-head, such as we find from the sculptures
 "were used during sieges to force stones from the
 "walls of besieged cities."**

This pick and saw are possibly the most remarkable
 facts capable of being adduced. As instruments or

* Nineveh and Babylon, p. 194, 195.

† *Ibid.*

‡ *Ibid.*

§ Several such bundles of *Iron* rods, recently shown to me at the *British Museum* by Mr. Newton, keeper of the *Greek Antiquities*, have been found at a later period in *Greece*.—*Sr. J. V. D.*

|| *Ibid.*

¶ *Ibid.*

** *Ibid.*, pp. 194, 195.

tools for use in structural operations they are the most ancient known, and their very forms which they have so well preserved show us that for purposes such as these tools are used, we have not advanced a step beyond the Assyrian of the Ninevite period, for they are identical with what handicraftsmen and labourers of to-day are provided with.

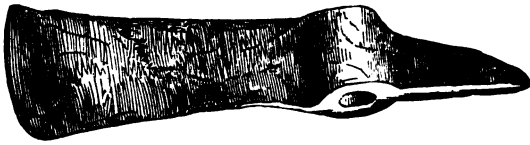


Fig. 11. An Iron Pick, from Nimroud.

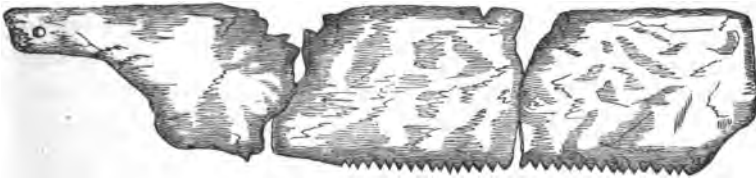


Fig. 12. Half of a Double-handled Saw, from Nimroud.

These old tools are, however, endowed with a much higher significance than what would have pertained to them had they been mere shapeless masses of the metal, for their form indicating unmistakeably the purposes for which they were employed, leads—in the mind of anyone having a practical acquaintance with the conditions which are essential in a saw, for example, to render it capable of performing the operation of cutting substances—to the inference that it possessed the properties of hardness and stiffness

which do not belong to that condition of the metal which is Iron merely, in the common acceptation of that name.*

In short, the mind is driven to conclude that the Assyrians were almost to a certainty acquainted with a process of manufacturing *Steel*. But so far we are aware, this conclusion has not any collateral evidence to bear it out, yet it is not improbable that the spear points, sword blades, and arrow heads which have been found in such quantities were of Steel also.

Dr. Percy has examined this old saw. He says of it that it is "similar in construction to that now used by carpenters for sawing large pieces of timber across. . . . It consists of a blade 3 feet 8 inches long and $4\frac{1}{2}$ inches broad throughout its entire length, except at one end, where it is narrowed, and was no doubt let into a handle of wood, the rivets being visible upon it. The other end was probably similar, but, unfortunately, it has been broken off. The metal seems to be wholly converted into an oxide, yet sufficient remains to strongly attract the magnetic needle; that is, supposing no magnetic oxide of Iron to be present. There is no evidence to show whether it originally consisted of Iron or Steel, though this point might possibly be ascertained by very careful chemical investigation. As an illustration of ancient metallurgy, there is no object in

* It is scarcely necessary to remark at this place that in using either the terms "Iron" or "Steel" the writer employs them in the sense of a condition of the metal which is distinguishable by either possessing or being devoid of the qualities of hardness and tempering, and not at all in the sense in which these terms are understood under the refinements of modern metallurgic science.—St. J. V. D.

"the Museum of greater interest than this rusted saw, which has only recently been exposed to public view. . . . It is computed that whilst it could not be later in date than 880 B.C., it may have been considerably earlier. The fact of Iron having been applied to common hammer-heads, for which Bronze might have proved a tolerably good substitute, indicates that Iron was certainly as cheap, if not cheaper, in those days than Bronze, and the correctness of this inference is strikingly confirmed by many other objects from the same locality." *

Since the discovery of the foregoing objects by Mr. Layard, we have witnessed the further discoveries of Mr. George Smith, who has recently added to the British Museum a rich collection of Iron relics from Mesopotamia. None of them are considered older, however, than from 800 to 1000 B.C., the chief of which we enumerate further on; and, whilst we do so, it must be understood as not at all for the purpose of adding further proof to the main point of this book, which is to show that undoubtedly man was familiar with the use of Iron and Steel in the earliest ages we can positively reach back to, or at the time when the earliest and grandest architectural works, besides some works of Art which the world has ever witnessed, were produced—but that having made the endeavour to collect all the available evidence on this subject which research into antiquity has up to the moment of our writing brought to light, it seemed desirable that it should be placed on record for the purpose of saving

* "*Metallurgy, Iron and Steel*," by John Percy, M.D., F.R.S. 1864. pp. 874-5.

others the tedium of threading their way through the rubbish heaps of the past to gather it again, whilst the evidence also testifies to the fact that Iron continued to be used for centuries afterwards, so long, indeed, as the Assyrian nation existed and continued to build, or employ themselves as warriors.

It should not be passed over either, that according to Herodotus and Pausanias, the Lydian King Alyattes, who died about 570 B.C., amongst other offerings, dedicated to his god an inlaid *Iron* saucer; also that, according to Herodotus, the Assyrians in the army of Xerxes carried shields, spears, daggers, and wooden clubs knotted with *Iron*.


Of the Assyrian Iron relics we refer particularly to the Ombos of a shield as the most exquisite piece of ancient Ironwork we have met with—as a specimen of thin hammered Ironwork, we indeed doubt if it can, in some respects, be surpassed by the productions of to-day, whilst, too, the Iron helmet • previously referred to, is another proof of the exquisite skill in respect of thin hammered Iron working the Assyrians brought to bear upon their productions. Nor was it in their Sheet or Plate Ironwork alone that they excelled, for there are in the British Museum collection, specimens of massive Ironwork also, such as what seem to be pieces of unfinished forgings; a rude triangular lump through which a round hole appears to have been driven by a punch whilst hot; several round bars both straight and curved; an Iron ladle such as plumbers use to-day for • melting lead in, and pouring it with, over joints which have to be united; several rings of various sizes, one


three inches in diameter, and a signet ring of Iron curiously enough containing a die or seal of silver; wall cramps and nails; portions of implements formed with a long pointed end as if for insertion into wooden handles; pieces of chain; the head of a large flat instrument with thick though apparently what had been sharpened edges; an Iron wall hinge; a mass of fine chain armour of exquisite workmanship; and lastly, a portion of what appears to have been a double sided comb—not unlike what we use to-day for combing horses' manes with.


Whilst speaking of these specimens of Iron from Assyria, the writer thinks it proper to explain that it was his intention to have illustrated the relics by woodcuts of each. He finds, however, that method of representing them on a small scale totally inadequate to convey to the eye truly the character of the specimens, and the manner in which the photographs have been taken—namely, on the slabs of oak to which they are attached in the cases at the museum (the authorities there not allowing them to be removed therefrom whilst being photographed), render the photographs themselves as they stand unfit for pictorial illustration of this book, besides being too large for that purpose, so that the writer can only urge those who desire to know more about the Assyrian Iron relics than is conveyed by the description of them here given, to visit the British Museum and examine them there. The principal specimens, including the saw, will be found in the Lower Assyrian Gallery, commonly known as the “Assyrian Basement Room;” those recently discovered by Mr. George Smith, in cases

66 and 67, as well in a new case at the left side of the Lower Egyptian Gallery ; and after all, the specimens are more telling as to their significance than any words respecting them can be.







Yet whilst Mesopotamia has not up to the present time produced any solid evidence in the form of material Iron relics which can without doubt be set down as belonging to the very *oldest* monarchies, nevertheless the monuments of those earliest times are numerous, and they yield abundance of testimony, as we have previously hinted at page 106, of another and almost equally strong, certainly a more enduring kind, to the acquaintance of the contemporary people with Iron.

We are informed by Mr. George Smith that the cuneiform symbol for Iron is  but that its phonetic value or pronunciation is not yet determined. It is found in inscriptions of all ages, and, Mr. Smith says, "must have been in use 2000 " B.C." This, however, he informs us is not an Assyrian word, but one distinctly belonging to the ancient Babylonian or Proto-Chaldean—*i.e.*, Sumirian or Akkadian—people who inhabited the lower parts of the plain. There is, in fact, no pure Assyrian word for Iron, but this older one appears to have been grafted into the more recent Assyrian language.

In the inscriptions Mr. Smith further informs us that each god is mentioned with his sign, and this word  is the sign of one of the gods of war and hunting, a symbol of his particular god-like attributes, a parallel indeed to the symbols we have found in the cartouche of the Iron King of Egypt, in the third dynasty of Memphis. Whilst on the one

hand, then, Mr. Smith denies the discovery as yet of the phonetic value of this Proto-Chaldean symbol, on the other hand it should be mentioned that Professor George Rawlinson, of Oxford, has many years since published the word "*Hurud*" * as the Chaldean equivalent for Iron, but whether he gave this as the phonetic value for  we have until recently been in doubt. Uncertainty on that question is however now removed by the following statement in regard to the cuneiform signs, with which we have been lately favoured by the Rev. Professor George Rawlinson, who, writing from Canterbury, says:—

"I delayed answering your letter until I could consult my brother† on the subject, as I was not quite certain with regard to one or two points. I am now able to give you the benefit of his superior knowledge.

"There are two signs of metals in Assyrian with respect to which there is a doubt, which is Iron and which is Brass (or Bronze rather). These are  and . My brother on the whole inclines to regard  as Bronze and  as Iron. The former  is nowhere rendered phonetically, but the latter  is rendered in a syllabary as equivalent to *hurud* in Akkadian and *eru* in

* Vide *Five Great Monarchies of the Ancient Eastern World*. By the Rev. Professor George Rawlinson. London, 1871, vol. i., p. 62.

† Sir Henry Rawlinson.

“ Assyrian. Mr. George Smith reverses the meanings of the two signs. The point is a very doubtful one.”

Thus far, then, we have dealt with the testimony which the Akkadian, or Sumirian, and Assyrian monuments and relics afford us; and, according to natural order, the next step in our investigation is to proceed to the sacred literature of the Semitic race—namely, the Pentateuch, or, we might indeed say, the entire Sacred Hebrew Canon. But it will be sufficient to refer here to the Mosaic books, and the probably still older book of the Orient sage, Job..

It would be superfluous to quote from all the numerous allusions to *Iron* in the earlier Scriptures; and, indeed, it would fill a not inconsiderable volume to comment to the full upon the many-sidedness of the references themselves—which is indeed beyond our present purpose, for we deem it sufficient to show from these allusions that, about 1500 B.C., or at the time when Moses is commonly computed to have written, the properties of Iron had been so well observed, and its practical uses so well understood, that, by means of those properties and uses, there was found in it a ready symbol or comparison for the exposition of many parabolic allusions.

But we are aware that, in touching anything Mosaic, we are liable to be called in question for treading upon treacherous ground, if we are to trust the dicta of those who, in certain quarters, have allowed Hyper-criticism, and this alone, to constitute the Criterion by which not only Tradition, but much evidence of fact as well, have come to be overridden; who have concluded to deny the authorship of a book which an incomplete

knowledge of the Hebrew,* and on that account the exceeding difficulty of comprehending in many cases the sense of the original, which it cannot now be doubted, certainly with reference to the Authorised Version, and possibly neither in respect of the Septuagint nor Vulgate, has been exactly rendered, has caused them to discredit, or to assert, as we lately read, that "it is now known that the Pentateuch is of very moderate antiquity, and much of it of Aryan origin."

When it shall be shown that this assertion is even a deduction of sound criticism, and not the conclusion due to the preconceived notion of a probability, which so much of modern research seems contented with if it proceed far enough to establish, and then to stop short, without going a little further on to ascertain whether, deeper down again, there be not perchance weightier testimony of a counter kind which would give such preconception the lie, indicate the value of that unknown quantity "Bias," and prove that the critical faculty alone is absolutely incapable of ascertaining that value, still less of investigating all that is essential to evolving the absolute truth.

This, however, is not the place to discuss, nor have we the presumption to attempt to discuss, vital questions as to the authority of the Hebrew Canon; therefore we would only remark, whilst outside the threshold of an edifice of which the poet has said—

"Fools rush in where angels fear to tread,"

that when it shall be conclusively shown that there is an older literature (apart from the records on the

* "In no language are found words and roots with so various, and not unfrequently opposite significations, as in the Hebrew."—*Professor Breslau.*

monuments), and of a kind like to that of the Pentateuch, or the Book of Job, from which these could possibly have been derived, then we shall listen in profound reverence; or even when it shall be shown that there is another literature equally old from which the sacred literature of other nations has or even could have been derived, and that those others which exist are not in most cases, if not in every case, ethnically connected with, that is to say, a gloss and commentary upon, and therefore derived from, the contents of the more ancient Hebrew Canon, invented by the priesthood for professedly teaching, but in reality blinding and gaining power over the people and neophytes—then may our trust be shaken.

Before, then, we discard the authority and age of the Hebrew Pentateuch, and far, even as we are, from not admitting the numerous difficulties it is fraught with, let us not forget that German, French, and British students of Oriental lore have for years been striving to show that the Vedas, Puranas, and other Sanskrit sacred books besides the Zend Avesta, are very old indeed, and older than the Pentateuch, but that the real outcome of those results is, "That no monuments inscribed in Sanskrit or its " nearest Indian dialects are older than the 4th century " B.C. It is a problem yet to be solved what was the " oldest Aryan alphabet? Was it Greek, Syrian, or " Lycian? As yet none is known older than the 7th " century B.C., and of course they are all comparatively " recent compared with the Egyptian and Babylo- " nian"* or it might well have been added to the

* Inaugural Address by Dr. Birch to London Congress of Orientalists, Sept., 1874.

Hebrew also, if we even admit for the moment the low date assigned by critics for their alleged compiling or alteration of the Pentateuch by Esdras; and with respect to the Zend Avesta, it is shown* that the oldest texts belong to the reign of Ardeshir, A.D. 226, whilst "In the Zend Avesta it is declared that the "religion taught in it was received from Abraham;" and according to Hyde, "who supports his statement "by quotations and references, this was believed by "leading Arabian writers, not only of Persian Magianism, but of Indian Brahmanism." † . . .

Having thus briefly alluded to what appears to us as the inconsistent ground upon which not a few of the foremost European scholars have concluded the Hebrew Scriptures to be unworthy of credit, we at the same time are far from denying the existence of much therein which, to our present vision, appears irreconcilable, inexplicable; but when it is the fact that this bears but a small proportion to all the remainder which is intelligible; when also the whole book itself is constantly receiving corroboration from exhumation in the East of contemporary monuments, and that the further modern science is pursued, by so much are its conclusions found not inconsistent, but all-fours with the few references touching upon Physics or Astronomy, which the Hebrew Scriptures contain—we are quite

* Avesta, the religious books of the Parsees. Spiegel & Bleck. Intro., p. x.

† "Seven Homilies on Ethnic Inspiration," by the Rev. Joseph Taylor Goodsir, p. 73, 1871, and who adds that Hyde also "pointed out how "Magianism, as set forth in its sacred books, taught that the human race "sprung from a single pair; that it bore testimony to the occurrence of the "Flood; that it mentions Noah and his sons; that as for Abraham, as already "stated, it declares him to be its own author; and that *it makes mention also "of Moses."*

content to bide our time and wait the proof or disproof of the remaining difficulties—whether of apparent contradiction for those of chronology; for is it much to be wondered at, when in the past, that is to say, before pure or abstract and, in particular, experimental science was cultivated—the Physical Revelation of the Creator—the Universe—on the one hand, not being understood, was looked upon as replete with opposites and the meeting of extremes, and which by such investigations are now demonstrated as the direct results of Kosmic Law—ever active in ringing out the Music of the Spheres in Chimes of Endless Harmony? Is it to be wondered at, we say, with such example of the past in relation to one branch of Revelation, that with respect to that which the Tradition and Authority of the whole Hebrew race, as well as its own internal evidence, stamp as another branch of Revelation, that it should likewise as yet be, in part, undervalued, because not yet comprehended? What was said by Sir John Hawkshaw in closing his recent address to the British Association at Bristol was well said. “Need we try to extend our vision into futurity further? Our present knowledge, compared to what is unknown, even in physics, is infinitesimal. We may never discover a new force, yet who can tell?” And to which we may add the parallel, “who can tell when and by what means we may discover fresh evidence which shall clear up the other difficulties surrounding this hoary Semitic literature to our better understanding thereof? for although the difficulties are admitted, yet they are not sufficient to warrant the tossing overboard of the whole book.”

With this proviso, then, we proceed to the references to Iron which this old Hebrew literature contains:—

(1.) *Gen. iv. 22.* — “Tubal *Obs.* — This, the earliest Cain an instructor* of every known mention of Iron, is in “artificer in brass† and Iron.” a “utilitarian sense.”

* According to the “Speaker’s Commentary,” vol. i. p. 57, it would appear that the word here rendered “instructor” should rather be “sharpener.” Onkelos, however, has it “instructor,”—The LXX. and Vulgate, “a sharpener of every instrument in bronze and iron.”

Dean Alford, in his posthumous fragment of a “revised version” of the Old Testament, translates the Hebrew word *חָפֶז* (*lah-tash*) into the English “forger,” rendering the passage “Tubal Cain, a *forger* of every kind of instrument in brass and iron.” Upon which he has also the following note:—“The sense may be as in A.V., but the revised text is preferred by the Hebraist, the sharpener being taken not figuratively, as *instructor*, but literally as a *forger* or *polisher*, and the latter noun, which is literally only “cutting,” that which cutteth, being understood of the tool, not of its maker.”

+ “The word here rendered, *brass*, is certainly either *bronze*, or, more probably, a native metal, *copper*” (see Smith’s “Dict. of Bible,” art. *brass*).

“Whether we must understand that he invented the use of both copper and iron, or only of copper or bronze, which led in course of time to the farther invention of Iron, it may be difficult to decide from the concise and obscure wording of the text. That the most ancient inhabitants of Europe were ignorant of the use of metal, as indicated by the discovery of flint weapons in the gravel, can be no proof that they were unknown to the early descendants of Adam.”*—*Speaker’s Comm. Intr.*, p. 57. vol. i.

So also Dean Alford. “This word, which occurs very commonly, is always rendered *brass* in the A. V. In strict accuracy it ought to be *copper*, as the mixture of copper and zinc now known as brass was not known to the ancients.”—*Revised Version*, p. 24.

Also “*whetter*” (see margin).—*Speaker’s Comm.*

“Havernick (Introd. to the Pentateuch, Translation, p. 104) has shown that the traditions of ancient nations, the Phœnicians, Egyptians, Greeks, &c., refer the invention of agriculture to the mythic ages, and that the investigators of History, Herda, Link, Schlosser, &c., have been led to the conclusion that the discovery of the breeding of cattle, of agriculture, and of the preparation of metals, belong to pre-historic times, and that in the historic period these arts have made comparatively no great advances.”—*Note A, Speaker’s Comm.*, vol. i. p. 58.

* We may remark, that although this may be assumed by the writer of the commentary, yet it most certainly is not proven “that the most ancient inhabitants of Europe were ignorant of the use of metals,” for it is almost certain that this is an inference not borne by the true relationships of the “finds,” when viewed in connexion with geological upheavals and depressions.—St. J. V. D.

(2.) *Lev. xxvi. 19.*—"I will
"break the pride of your power,
"and I will make your heaven
"as *Iron*, and your earth as
"brass."

Obs.—"Iron" is here used in the metaphorical sense of "resistance." In the material world, Iron is the most resistant of all common substances known; hence it is invariably used to resist every kind of stress. The Supreme, by reference to this property of a material with which the Hebrew people had become familiar by its frequent use in their ordinary avocations, typifies to them how intense his opposition to them should be. "I will make your heaven as Iron if ye walk contrary unto me and will not hearken" (v. 21).

(3.) *Numbers xxxi. 22-3.*—
"Only the gold, and the silver,
"the brass, the *Iron*, the tin
"and the lead, everything that
"may abide the fire, ye shall
"make it go through the fire,
"and it shall be clean."

Obs.—The verse is curious as illustrating the variety of metals in use at this early date for domestic purposes. All these metals were in common use in Egypt centuries before the date of the Exodus. At this place the metals are cited as those things in the material world resisting the most intense purification, even the penetrating, searching, all-piercing action of fire—enduring the fire and coming thereout cleansed, renewed.

(4.) *Deut. iii. 11.* — "For
"only Og, King of Bashan,
"remained of the remnant of
"giants. Behold! his bedstead

"was a bedstead of iron.* Is
"it not in Rabbath of the chil-
"dren of Ammon? Nine cubits
"was the length thereof, and
"four cubits the breadth of it,
"after the cubit of a man."

(5.) *Deut.* iv. 20. — "The
"Lord hath taken you and
"brought you forth out of the
"Iron furnace, even out of
"Egypt."

(6.) *Deut.* viii. 9.—"A land
"whose stones are Iron, and out
"of whose hills thou mayest
"dig brass." †

Obs.—At this place the great
importance of Iron to a people
is plainly referred to—as one
of the great possessions or
riches of the land to which the
Hebrew people are brought.

* *A bedstead of Iron.* "The Iron was probably the black basalt" ('eisen-stein') of the country, which not only contains a large proportion, about 20 per cent., of iron, but was actually called iron, and is still so regarded by the Arabians. So, too, Pliny, 'Nat. Hist.' xxxvi. 11. 'Juvenit Egyptus in Ethiopia quem vocant basaltens ferrei coloris atque duritiæ. Unde et nomen ei dedit.' Iron was, indeed, both known and used principally for tools at the date in question by the Semitic people of Palestine and the adjoining countries" (see Wilkinson, "Ancient Egyptians," ii. pp. 154 seq.; Rougemont, "L'Age du Bronze," p. 189). "But bronze was the ordinary metal of which weapons, articles of furniture, &c., were made.

"The word translated, 'bedstead' עֶרֶס (*eres*), is derived from a root signifying 'to unite, or 'bind together,' and so 'to arch' or 'cover with a vault.' Its cognate forms in Arabic and Syriac have parallel significations. The word may certainly then mean 'bier,' and perhaps does so in this passage. (So Knobel, Winer, Von Langerke, &c.) Modern travellers have discovered in the territories of Og, sarcophagi, as well as many other articles made of the black basalt of the country."—*Speaker's Comm.*, vol. i. p. 814 pt.

† "For brass read copper. We have a highly poetical description of mining operations" (*Job.* xxviii. 1, 2). "Mining does not seem to have been extensively carried on by the Jews, though it certainly was so by the Canaanitish peoples displaced by them" (see Rougemont, "L'Age du Bronze," pp. 188 seq.) "Traces of Iron and copper works have been dis-

(7.) *Deut.* xix. 5.—“When
“a man goeth into the wood
“with his neighbour to hew
“wood, and his hand fetcheth
“a stroke with the *axe** to cut
“down the tree, and the head
“slippeth from the helve,”
&c., &c.

Obs.—This is powerful literary proof that *Iron* was so common, and in quantity sufficient, to be used for such an ordinary tool as a timber axe as early, at least, as 1450 B.C.

(8.) *Deut.* xxxiii. 25.—“Thy
“shoes shall be *Iron*† and
“brass; and as thy days, so
“shall thy strength be.”

Obs.—Here “*Iron*” is used as the type of firmness, stability, and endurance, which was the characteristic of Asher.

(9.) *Joshua* xxii. 8.—“Re-
“turn with much riches unto
“your tents, and with very
“much cattle, with silver, and
“with gold, and with brass and
“with *Iron*,” &c.

(10.) *Job* xxviii. 2.—“*Iron*
“is taken out of the earth, and
“brass (copper) is molten out
“of the stone.”

Obs.—Here then it is clear from what source *Iron* was obtained in early ages, and showing that there is no need to beg the question by supposing it to have been taken from meteorites.

In closing this chapter, it may be well to point out the conclusions which follow the evidence it contains, viz.:—

1st. That *Iron* was well known to and used by the

“covered by modern travellers on Lebanon” (Volney, “*Travels*,” ii. 438)
“and many parts of the country—*e.g.*, Argob (in Bashan) contains ironstone
“in abundance.”—*Speaker’s Comm.*, vol. i. p. 831.

* “*The margin* has this, in the Hebrew, ‘*Iron*.’ Literally ‘with the axe’ is
“‘with the iron.’”—*Speaker’s Comm.*, vol. i. p. 871.

† *Margin*.—“*Under thy shoes shall be iron.*” “The territory of this tribe
“probably contained iron and copper.”—*Speaker’s Comm.*, vol. i. p. 925.

earliest inhabitants of Akkadia or Sumiria, which, as we have seen, is alleged by some of the authorities * to be the country wherein the very earliest relics of the human race have as yet been found, this being proved by the mention of that metal in the earliest inscriptions; and judging from the hardness of the stones which they engraved, it is almost certain they were acquainted with a process for making Steel.

2nd. That *Iron* continued in use after the first Chaldean kingdom had passed away, and the reins of power were held by the Assyrians.

3rd. That under the Assyrians the manufacture of Iron continued to be practised with a high degree of excellence; and that, indeed, it is most probable they were acquainted with a process for making steel.

4th. That the Hebrews were well acquainted with Iron and its properties.

* *Ante*, page 103.

CHAPTER V.

PHENICIA, GREECE, AND ROME.

In part a Digression.

WE have headed this chapter "in part a digression," for in truth it is so. The facts herein recorded as to the use of Iron and Steel by the Greeks and Romans, belonging as they do to an era so much later than those to which we have been addressing ourselves—that is to say, to the historic period—do not bear in any respect upon the crucial point of our inquiry; yet as here put together—we believe for the first time—they are of no little interest, and form the connecting link between the *pre-historic* and *historic* ages, it strikes us that we shall hardly incur censure by introducing what is herein contained; for, if it serve no other purpose, it will at least go far to prove that with the several races who have successively held sway in the world from the most remote to our own day the use of Iron and Steel has retained its place without interruption.

Before we can reach literary evidence of the use of Iron in Phœnicia, it is essential, on account of the actual records of that race having been almost entirely lost,* to ascertain what we can at second-hand—that

* *Ante*, page 59.

is to say, through what has been handed down to us in the literature of another nation.

We have, then, now to pass down the stream of time to the Greeks, and in the records of which people we find striking evidence of their acquaintance with the use and manufacture of Iron and Steel. Through the Greek translator of Sanchoniathon, the Phœnician historian—Philo of Byblos—we receive a scintillation that the Phœnicians were workers in Iron, which, of course, we have been already led to infer from the fact of Inscriptions existing in their language which could hardly have been produced without the aid of Steel Tools. The Moabite Stone, found by Klein among the ruins of Diban on August 19th, 1868, being of basalt, exceedingly heavy and therefore hard, is inscribed in Phœnician, and our readers need scarcely to be reminded of those other * Inscriptions in that language, to which we have previously drawn attention. Sanchoniathon, through Philo, speaks of the Technites, which is a Greek rendering corresponding to the Phœnician name; while both Sanchoniathon in ancient, and Bunsen in modern times, identify the Pentateuchal Tubal Cain and the Technites; Buttman and others, again, comparing with the Biblical Tubal Cain, Vulcan, and the Telchines of classical tradition.† The equivalent of this name,

* *Ante*, page 58.

† “Technites is manifestly a Greek translation of a corresponding Phœnician name, which has unfortunately not been handed down to us, and “there is no denying that ‘Smith’ is a pretty tolerable, if not an exact, “rendering of the Greek word. Buttman and others have preferred to compare with the Biblical Tubal Cain, Vulcan and the Telchines of classical “tradition. There is no question that the name of the grimy cripple of “Lemnos, and the occupation of the God working along with the Cyclops

Technites, like nearly all else belonging to the language of Phœnicia, has not come down to us in the original; but as we have its Greek value—and there can be no doubt, says the Rev. Basil Cooper, that “Smith is a pretty tolerable, if not an exact, rendering of the “Greek word”—we may safely infer that Iron was not unknown in Phœnicia.

As characteristic of that one-sided consciousness of superiority which showed itself prominently through so many phases of the Greek mind during the period of climax of their history, it is not surprising that, terming other nations “barbarians,” which, as compared with themselves during that period, the Non-Hellenic nations were, the Greeks should attribute to themselves the discovery of Iron, after the manner handed down to us in the Pelasgic tradition, connecting it with the Telchines of Rhodes, and Crete, the reputed first workers in metal, and the Idæan Daktyls* (Δάκτυλοι Ἰδαῖοι), professing that that discovery

“in the forge of Etna, presents a fair handle for such a comparison. But “the word *volcano* and the Sicilian locality of the classical myth point to a “very different etymology of the God’s name. Nor does the philology of the “present day seem any better satisfied that the Telchines of the Rhodian “tradition, that autochthone family of smiths, of whom the insular historian “Zeno tells such wonderful narratives, have anything to do with Tubal “Cain, in spite of some similarity in the names.”—*The Rev. Basil H. Cooper. Trans. Dev. Assoc.*, 1868.

* The following letter was addressed to the Author some time since. To the philologer it will prove interesting and important:—

“CLYDESDALE VILLA, TOR PARK, TORQUAY,
26th January, 1871.

“DEAR SIR,

“One or two thoughts bearing on the tradition about “the Idæan Daktyls have struck me, which may possibly interest you.

“Ida is the Phœnician and Hebrew word יָד (YAD)=Hand, of which the “Daktyls or Fingers are the Peaks. The Mythological Daktyls are the Peak

took place on the occasion of the burning of the forest which crowned their native Cretan mountain. The date of that conflagration, according to the Parian chronicle and other authorities, is the fifteenth century before the Christian era, or more precisely B.C. 1462;

"people (of whom the priests of the mountain Mother Cybele, called Daktyls, claimed to be the representatives), which wrought the mines of the mountain. I am disposed to connect the *Ida-feld* and *Asi* of the Norse Mythology, and even the German word *Eisen* * (our Iron), nay more, the Greek *ειδης*, with the old Culture Myth of the Daktyls. The last is simplified by a reference to the Coptic $\text{O} \text{I} \text{A}$ = Hand. The first letter shaped like the Greek Sigma, and called by a name derived from it—the *Tsima*—seems, to judge from that name, to have sounded Ts, although, possibly, it may have had the sound of the French J, or of our own Z in the word *Azure*. The last, called the *Djandja*, sounded like our J. Hence *Tsij* or *zij* = *ειδης*, of which *ειδης* would be simply an adjectival form = Idæan (sc. metal).

"The Phrygian *Ida* must be that meant in the original tradition. Its two principal Peaks were *Gargaron*, with its *Zeus* cultus, known already to *Homer*, and *Kotulos*. The former is probably a Phœnician word like the name of the mountain, and answers to the *Galgala*, by which the LXX. transcribe the *Gilgal* of the Bible. The name means Circle, and seems to point to a Keltic Circle of Stones, and to the worship of a *Jupiter Tonans*, to whom would answer the *Damnomenos* (=the Hammerer—Thor), whom we find among the Three Original Daktyls. *Kotulos* is Greek, for the more common *Kotule*. The form *Kotulos* is found in a work ascribed to *Homer*—meaning Cup—and at once suggests the Crater of a Volcano, or Burning Mountain, as the tradition represents *Ida* to have been. This Peak would best answer to *Kelmis*, the Smelter, a personification of the Smelting-furnace, whence the molten metal flowed. As to the third Peak, to answer to *Akmon*,† the only suggestion I have to offer is, that an *Akmon* is mentioned as the father of the Phrygian King *Mugdon*, spoken of in *Il. iii.* 184-190.

"If these rough jottings be deemed worth your notice, they are much at your service.

"Yours, DEAR SIR, very truly,

"BASIL H. COOPER.

"ST. JOHN V. DAY, Esq."

* Gothic, *AIZ* = *AID-s*, the *s* being flexion.

† The exquisite intricacy and significance of recondite idea involved under the three names, *Gargaron*, *Kotulos*, and *Akmon*, might form the basis of a vast exposition, which would be out of place here.

I think it exceedingly probable that *Gargaron*, from the verb *γασγαιω* = to swarm with,

and this is also the period to which the Rhodian myths of Zeno respecting the Telchines seem to point.*

Nor is the foregoing a solitary instance of literary testimony among the early Greeks as to their acquaintance with the metals. The shield of Achilles, described as of such excellent and intricate workmanship, in the Homeric epic, is another instance; whilst to Aristotle himself we are indebted for nothing less than an actual account of the mode in which the Greeks made Steel in the 4th century B.C., proving them at the same time to have been acquainted with Iron in the *molten state* also. The passage has been translated by Mr. Martin Lister,† and reads thus:—"Wrought Iron itself may be cast so
" as to be made liquid, and to harden again; and
" thus it is they are wont to make Steel (τό στόμωμα);
" for the scoria of Iron subsides, and is purged off

* See the Rev. B. Cooper's Paper, p. 19.

† *Phil. Trans.*, vol. iii., Abridged ed., p. 571.

from which the name of the Mountain γασγῶσα = heaps = heaped up = heaven—i.e., that by which the female or womb is caused to heave up, to become tumescent in the course of productiveness, answers, as the Rev. B. Cooper suggests, to the Galgala or Gilgal, which was

represented in ancient times thus,



, the symbol of male generative power, the

φάλλος—the Great Father of production. The names of numerous Hills and Mountains are of deeply recondite meaning. In short, Mons and Hill, signify that which is heaved up, all-significant of the functions of generation and sustentation of life—e.g., a well known and familiar instance, the "Paps of Jura," which any mind, endowed with insight, needs but to see in order to appreciate the typical idea involved.

In Kotulos, the meaning is still more plain; it was the type of the female receptive, and in union with the male co-productive power or organ, was truly the Crater, from which, under the symbolism portrayed, in due time was sent forth the fruit of the all-mysterious working within of the fires of natural affections and forces. See κούλος = anything hollow, whence κοιλία = the Womb.

Akmon is the Anvil, in which we see not only the instrument, but, after birth, the testing operation by which the Great Father further wrought out the mysterious progeny into that condition which more or less closely likened its illustrious parentage—in fact, committed forgery by endeavour to produce the Hieron Elkon. We shall further on see the parallel of this in the Altar on which the God Agni of Indian Fame is born by the union and mysterious internal heat-working of the coitus of the Suastika and Pranantha.—St. J. V. D.

“ by the bottom; and when it is often defecated and made clean, this is Steel. But this they do not often, because of the great waste, and because it loses much weight in refining; but Iron is so much the more excellent the less recrement it has.” Somewhat obscure, no doubt, this Aristotelian passage is; yet, when we carefully sift the nature of that which it conveys to us, it is replete with significance, as describing very briefly and imperfectly, no doubt, what can scarcely be any other than a process of making Steel, used in Germany certainly as late as the sixteenth century, that being proved from Agricola,* and, as we shall see further on, was used in China at the same period. The same process, too, was in use in the Island of Elba as late as 1683, A.D. (Kircher); and this place has been famous, from

* *De Re Metallica*, lib. 9. Agricola describes the process thus:—“ Make choice of Iron which is apt to melt, and yet hard, and may easily be wrought with the hammer; for although Iron, which is made of vitriolic ore, may melt, yet it is soft, or brittle, or eager. Heat a parcel of such Iron red-hot, and cut it into small pieces, and then mix it with a sort of stone which easily melts; then set in the smith's forge, or hearth, a crucible, or dish of crucible metal, a foot and a-half broad, and a foot deep; fill the dish with good charcoal, and compass the dish about with loose stones, to keep in the mixture of stone and pieces of Iron. As soon as the coal is thoroughly kindled, and the dish red-hot, give the blast, and let the workman put on by little and little all the mixture of Iron and stone he designs. When it is melted, let him thrust into the middle of it three or four or more pieces of Iron, and boil them therein five or six hours with a brisk fire; and, putting in his rod, let him often stir the melted Iron, that the pieces may imbibe the smaller particles of the melted Iron, which particles consume and thin the grosser ones of the Iron pieces, acting like a ferment to them, and making them tender. Let the workman now take one of the pieces out of the fire and put it under the great hammer, to be drawn out into bars and wrought; and then, hot as it is, plunge it into cold water. Thus tempered, let him again work it on the anvil, and break it; and viewing the fragments, let him consider whether it looks like Iron in any part of it, or be wholly condensed and turned into Steel. Then let the pieces be all

the time of the Roman Empire for the production of Steel.*

In the Greek department of the British Museum, whilst it may be said to teem with rarest specimens of early metallurgic art—these more especially consist of Bronze: see for example the famous Castellani collection, recently purchased at so large a price—yet, whilst Bronze relics carry off the palm in the sense of number and as belonging to high art forms, Iron relics are, nevertheless, not wanting there. They are in fact numerous, and we lately had the opportunity of examining several of these at the hands of Mr. Newton, the keeper of the Greek collection; yet as it happens that modern Greeks view the “finds” of their ancient brethren’s handiwork more especially from the side of art forms rather than with reference to technical methods and instruments used in production, it results that up to the present time there is but little reliable information collected as to the application of technic knowledge to the practical production of their works of art among the Greeks. It is true we have inquired into their exquisite work in Sculpture, Architecture, Literature, Philosophy, and Grammar, but in respect of their technical methods, either as to their intrinsic character or periods during which they were exercised, we have scarcely troubled our-

“wrought into bars; which done, give a fresh blast to the mixture, adding a little fresh matter to it, instead of that which had been drunk up by the pieces of Iron, which will refresh and strengthen the remainder, and make still purer the pieces of Iron again put into the dish; every which piece let him, as soon as it is red-hot, beat into a bar on the anvil, and cast it, hot as it is, into cold water. And thus Iron is made into Steel, which is much harder and whiter than Iron.”

* *Phil. Trans.*, vol. iii., Abridged ed., p. 571.

selves. Hence it is not surprising that, as a sequence of the dilettante spirit which has been exercised hitherto, there are to be found several Iron, not improbably Steel, specimens in the Greek halls of our national Museum, regarding which it may almost be said that little or nothing is exactly known, and most certainly not chronologically. There are to be found there wedges, bars, arrows, and spikes, besides various other larger and smaller relics; but beyond mentioning the fact, it would not be safe for us at the present to attempt to fix their chronological era.

From all the evidence we are led to infer that probably for about 3700 years the production of Steel, by immersing bars of Wrought Iron into a molten carburet of Iron was practised among the nations in their progress westward—brought from Egypt, almost to a certainty, by the Greeks—established by them in the Mediterranean countries they occupied—whence it was acquired by the Romans, and by them introduced throughout their vast western empire. Daimachus, a writer contemporary with Alexander the Great, speaks of four different kinds of Steel, and the purposes to which they were severally suited. “Of Steels (τῶν στόμωμάτων), “there is the Chalybdic, the Synopic, the Lydian, “and the Lacedæmonian. The Chalybdic is best for “carpenters’ tools; the Lacedæmonian for files, drills, “gravers, and stone chizels; the Lydian also is suited “for files, and for knives, razors, and rasps.”*

The Greeks also attributed to themselves the art of inlaying Iron, as we are informed in the account of

* “Elements of Metallurgy,” &c., by John Arthur Phillips. London, 1874. Page 7.

Herodotus respecting the large Silver bowl inlaid with an Iron saucer, which Alyattes, on recovering from his sickness, dedicated at Delphi. The bowl, it is said, "was made by Glaucus, the Chian, who first invented "the Art of Inlaying Iron," which is, however, an evident error, as we have seen (Chapter IV.) that this art was practised at an earlier period by the Assyrians.

In his "Private Diary" the Duke of Buckingham, at page 135, says, when speaking of the excavations in the amphitheatre of Syracuse—"The Wood and "the Iron could not have been less than 2000 years "in situ. The Iron highly oxidised possessed strong "magnetic properties."

From what Pliny had observed, and has handed down to us (lib. 34, c. 14),* it appears that the

* With regard to what Pliny has written, Dr. Martin Lister remarks (*Phil. Trans.*, vol. iii., Abridgement, p. 572):—"There is but one place that I know of "which may give us any sight into the inquiry concerning our tools, and that "is in Pliny, lib. 34, c. 14, when speaking of Iron, he says, '*Fornacum "maxima differentia est; in iis equidem nucleus ferri excoquitur ad induran- "dum aliter alioque modo ad densandas incudes malleorumve rostra.*' From "this passage it should seem that the ancients had one way to make Steel, "and another way to harden or temper their tools, particularly such as picks "and anvils. It is also plain, that '*nucleus ferri*' was melted down in both. "Again, the difference was in the furnaces—that is, in the manner of ordering "the Iron to be made into Steel, or for the extraordinary hardening of the "heads and tips of tools, and not in the matter of which they were made, for "both were done by boiling them in molten Iron. It cannot be doubted but "by '*nucleus ferri*' must be meant well-purged Iron; the same which Aris- "totle calls *σιζαορμίνος σιδηρος*; for why else should he tell us that Wrought "Iron itself may be made liquid, so as to harden again—that is, to cast again "into sow metal—if it was not to explain to us the manner of making Steel, "which they did probably after the precept above delivered—that is, not "only boil the Iron in its own sow metal, or liquid Iron, but hammer it also, "and after that quench it in cold water.

"As to the steeling of their tools, they boiled them in sow metal, to such a "degree of hardness or temper as was requisite, and did not afterwards hammer "them. And this seems to be implied in the phrase '*densare*;' for although


Romans in his time—*i.e.*, in the earlier half of the first century of our era—were well versed in the practice of Steel-making by the same process which the Greeks used. He describes Iron as occurring in almost all the then known parts of the world, and particularly in the island of Elba. Of Iron he says,* “Man delves the earth with it, plants trees, prunes his orchards, trims his vines, cutting off the older branches, and thereby throwing more vigour into the grapes; by its aid man builds houses, cuts stone, and prepares a thousand other implements; by it, even, atrocity and villany are effected and rendered common. Seeing that Pliny held the office of Spanish Procurator under Vespasian, it is at least very probable that his observations on Steel-making were made on the mode of manufacture established by the Romans in that country, wherein Toledo has been a famed seat for the production of swords of unrivalled temper and elas-

“it be generally said that Iron is purged and refined for the making of Steel, yet, according to the last and truest process, the matter is plainly otherwise; for Iron this way made into Steel, becomes a kind of electrum,* and is filled with an exceeding brittle and hard body† of its own nature; Iron being spongy and not close; for which purpose, therefore, the word ‘densare’ is by Pliny aptly and elegantly used. And this way was used when the strongest temper and hardness was required, as for picks and anvils. For which there might be several reasons given; as first, that it is easier to work Iron than Steel into any figure, that being far softer and more ductile and loose: again, it is certain, that Iron by ignition is spoiled or corrupted, so that the oftener it is purged, though it were Steel, it would the more relent. Whence the ancients, knowing well, that in making their tools of Steel, they must considerably loosen it, and abate of their temper; they therefore first shaped them, and then gave them a strong body of Steel and temper together, and so had nothing else to do, but to finish them on the grindstone and hone, to set the point or edge.”

* Hist. Nat. xxxiii. 14.

* That is to say, a mixed metal or alloy.—St. J. V. D.

† Carbon, I presume, is intended.—St. J. V. D.

ticity, from the time of the Romans until now—where, indeed, at the present day, the process by which their Steel is made, the Spaniards keep secret—a place, indeed, well worthy of mention in these inquiries, seeing that the Roman army was provided with Steel swords, many of them made there, with which they conquered the greater part of the then known world, including, too, these British Isles of ours, under Cæsar, B.C. 55. The process of converting Iron into Steel is not shown to visitors to the works at Toledo; but we were a few years ago informed in respect of the sword manufacture there, that although the process of conversion is not shown to ordinary visitors, yet all the work is *handiwork*.* The only machinery is the Tilt-hammer, driven by the waters of the Tagus. The Government of the ex-Queen Isabella pertinaciously resisted the introduction of modern appliances, lest, as they appeared to suppose, the quality of manufacture should suffer prejudice. They refused on this ground a lucrative offer of French capitalists to undertake the working of the Factory by modern methods of labour-saving. Apart from the nature of the Steel itself (for making which they say English Iron is useless), the most remarkable feature in the Blades is the method of piling. A thin bar of soft, tough Iron is laid between two wider bars of Steel, so that when welded the section of the blade shows a darkish-coloured core, thus .

* The Author is indebted to Mr. Cockburn-Muir, C.E., for an account of the Toledo sword manufacture, and he would gladly have published here that gentleman's *ipsissima verba*, but that he has been expressly forbidden to do so. The particulars here given are culled from that account.—St. J. V. D.

Mr. Cockburn-Muir says it is impossible that there can be a true weld* between two metals of such character, and that the remarkably pliant elasticity of the thin blades of Toledo is undoubtedly due almost as much to this method of piling as to the quality of the outer Steel sheathing. The temper is very remarkable. The tests are—

- 1st. Striking the blade fair on edge on a block of Soft Iron, before polishing. If the edge turn, the blade is rejected.
- 2nd. According to the thickness and purpose of the long blades, they are forced into a groove edge-wise, of a half, three-quarter, or whole circle. If the blade, when removed after a certain time, does not recover without set, it is rejected.

Blades of rapier-length are made which may be coiled into a hat, and when set free, recover their straightness like a flash of light. The Spaniards have a superstition about the tempering qualities of the water.

If further evidence be required of the common use of Iron by the Romans during the first century of this era, it may suffice to refer to the Coliseum (built by the Emperor Vespasian), in which the holes remain from which the Iron cramps by which the stones were held together have been removed in a later age of Vandalism. Similar cramp-holes are also to be seen in the stones composing the Arch of Titus, built by the Emperor of that name, who was the son of Vespasian.

* This is clearly a misconception, for it is perfectly well known that soft Iron and Steel not only "can be," but frequently "are" welded together, as any ordinary smith who knows his business can demonstrate.—St. J. V. D.

We have been informed by Mr. James Young, F.R.S., that when in Pompeii he observed a large Iron wedge driven in between the pavement stones of a street, also a bar or lump of Iron so placed as apparently to fill up a hole in a baker's oven, in place of a stone. At the same place Mr. Young saw an Iron pipe for carrying water, in which the longitudinal joint was riveted. This pipe was lined with what Mr. Young said to us he believed to be a cement; but that gentleman added that it was probable the lining resulted from matter deposited by the water.

Having thus traced the manufacture of Iron and Steel as proceeding from the (to us) nearer countries of the East, and transferred westward by the Greeks and Romans, we proceed to ascertain the evidence afforded by regions still further East.

CHAPTER VI.

INDIA.

WRITING, some few years since, on the "Early Use of Iron," we were constrained at the time to remark—"When the Archæology of India and China shall have been penetrated to the depth, we may hope to arrive at something more definite in respect of the practice in very ancient times, of the art we are considering; until that is done much ignorance thereon is inevitable; and in view of what little knowledge we do even now possess from the sparse nature of the information to our hand, even concerning comparatively late periods, we are led to hope for a great deal when the completer sources of testimony are bared to our vision."*

Yet, whilst we have, since then, succeeded with the help of others in gaining further and more exact knowledge of certain methods then practised, still, a review of what we have ascertained will be sufficient to convince the most sceptical how ignorant we still are of the stages through which metallurgy has passed in the East; and in regard to this state of things Mr. Robert Mallet, F.R.S., has so well written, that we cannot do better than quote his *ipsissima verba*:—"It is strange that of the Iron metallurgy of Asia, the mother-land of all the arts; of India, the country where, more

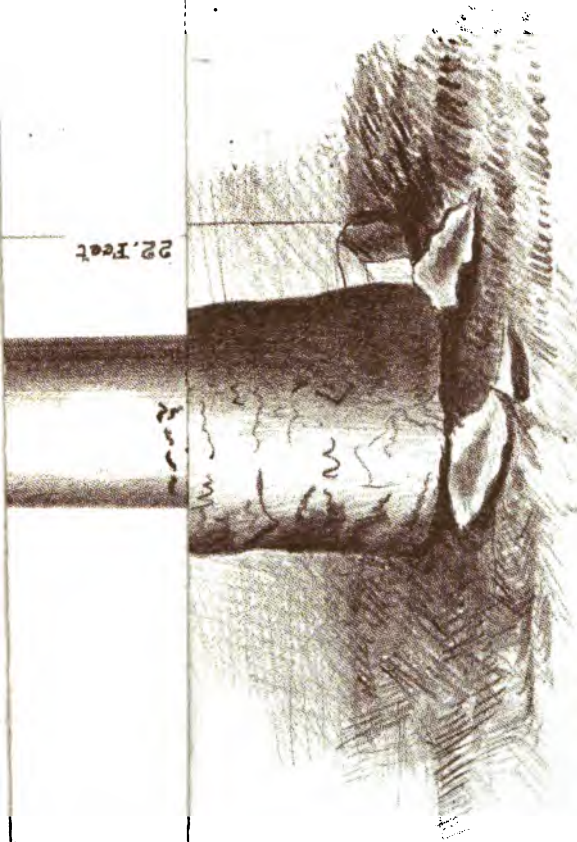
* Proc. Phil. Soc. Glasgow, 1872, p. 247.

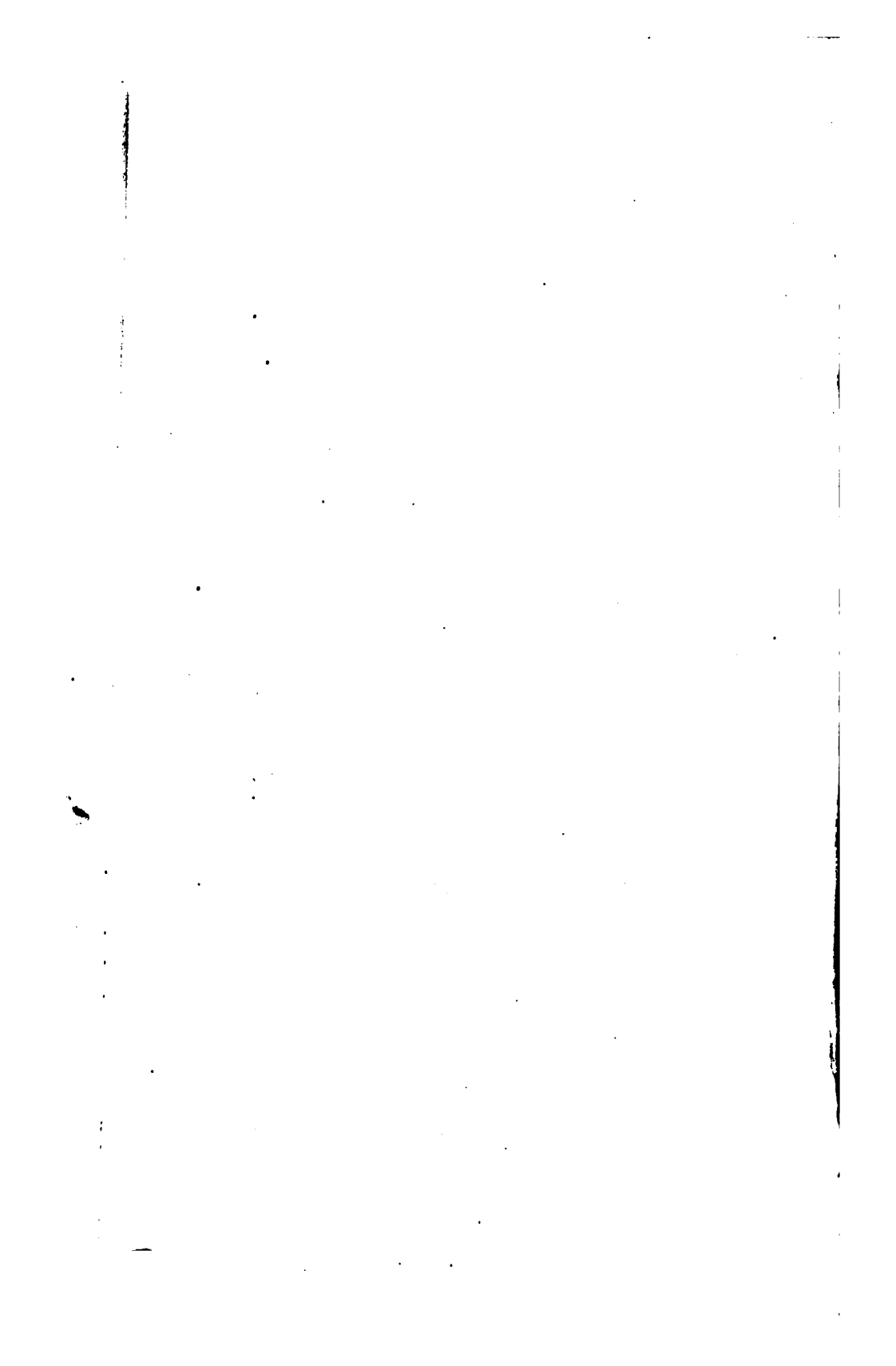
“ than twenty centuries ago, King Porus presented to
 “ Alexander the Great a *packa*, or wrought bar of
 “ Damascene Steel, just as Homer’s Achilles offered
 “ for a prize at the funeral games of Patroclus, a like
 “ valued mass, whence the Greeks obtained the like
 “ ‘ wonder-working sword blades ’ (*θαυμασια ξιφη*) where
 “ Steel dies were employed for coinage when our own
 “ ancestors* were naked savages; of China, whence
 “ cast iron hollow vessels now reach us of a combined
 “ magnitude and thinness that we have not yet been
 “ able to imitate, or even to imagine the process by
 “ which they have been cast; and razor Steel, said to
 “ surpass all European Steel in temper and durability
 “ of edge, less is known than of the Iron-working of
 “ any other part of the civilized world; yet such is
 “ the fact.

“ Central Asia, and even China, as yet, are nearly
terrae incognitæ; but India, south of the Himalayas,
 “ has been more or less open to European observation
 “ for centuries, and has been in our own power for
 “ more than one. How little is known of the working
 “ of Iron in China may be gathered from the bald and
 “ imperfect account of it given (pp. 52-58) by MM.
 “ Stanislas Julien, *Memb. Inst.*, and Paul Champion,
 “ ‘ *Preparateur au Conserv. des Arts et Metiers*, ’ in
 “ their work on the *Technical Arts of the Chinese Empire*,
 “ published in Paris in 1869; the first-named author
 “ having a reputation as one of the first Chinese
 “ scholars in Europe, and the second being a com-
 “ petent metallurgist and technologist. Yet China

* We presume Mr. Mallet means “ the ancient Britons,” who were not our
 ancestors.—St. J. V. D.

PLATE III.





“ possesses the knowledge of working in *fluid Cast Iron*, as well as in Wrought Iron and Steel—the first being at the present day, at least, commonly reported to be unknown in India, where Wrought Iron is made direct from the Ore, and Steel* also.”

Judging from what we gather among the monuments of India, the working of Iron in very large masses was carried on there many centuries since; for in the axis of the colonnade of the Masjid-i-kutb-ud-Islam and near one end of it,† in or near Delhi,‡ is standing at this day an Iron Lâht or column,§ which is described

* i.e., Wootz.

† There is much confusion in the different accounts we have met with as to the precise building in which the iron column is situated.

‡ There have been several cities at and near the site of modern Delhi, successively built and abandoned. The most ancient seems to have been built *circa* 1450, B.C. It was called Indrapat. The present name most probably originated from the Rajah Dhilu, who built a city there *circa* B.C. 50.

§ The author is much indebted to Col. H. Yule for a sketch of this remarkable Lâht, from which the accompanying plate has been drawn, and also for references to the literature bearing upon it, contained in the following letter:—

“GIARDINO INGLESE, PALERMO,
October 9, 1871.

“MY DEAR SIR,

“I have not been able hitherto to send the promised communication about the Iron Lâht or Pillar at Delhi.

“There is an account of it in Col. Cunningham’s ‘Report on the Archaeological Survey in India,’ for the season 1862-63, which forms a supplementary number to the *Journal of the Asiatic Society of Bengal* for 1864. “But Col. Cunningham, though describing it under its popular name of ‘the ‘Iron Pillar,’ calls it a solid shaft of *mixed metal*, about 50 feet in length, “and upwards of 16 inches in diameter. The total height above ground is “22 feet, but it has been *ascertained* to extend at least 26 feet below ground, “and the excavation did not reach the foundation, nor was the pillar loosened “thereby. Hence Cunningham supposes it may really be not less than 60 “feet in length. There is an inscription on it ascribing its erection to an “otherwise unknown Raja Dhaoa. The character of the letters is considered, “both by Prinsep and Cunningham, to refer it to the third or fourth century “of our era. It also bears later inscriptions.

“The translation of the inscription will be found in Thomas’s edition of

as follows by General A. Cunningham in the "Archæo-logical Survey Report to the Government of India for 1861-62:"—

Art. 65. "The Delhi pillar is a solid shaft of mixed metal, upwards of 16 inches in diameter and about 50 feet in length. It is true that there are flaws in many parts, which show that the *casting* (*sic*) is imperfect; but when we consider the extreme difficulty of manufacturing a pillar of such vast dimensions, our wonder will not be diminished by knowing that the *casting* of the bar is defective. The total height of the pillar above ground is 22 feet, but the smooth

"Prinsep's *Essays on Indian Antiquities* (1858), vol. i., p. 319-321. No doubt is there expressed as to its material. Prinsep calls it 'a monument of skill in *forging* iron, for the pillar is a well-wrought circular shaft of iron of considerable magnitude.'

"Cunningham again speaks as if it were *cast*. It is a pity the thing is left so obscure. I have seen the pillar twice or thrice, and it certainly seemed to me a shaft of wrought iron to all outward appearance. But, query, whether if it were really iron the surface could have remained perfect as it is—polished* and bearing the superficial inscriptions—for 1600 years?

"It is mentioned by the Arab traveller, Ibn Batuta, who was at Delhi *circa* 1340. He says (*Voyages d'Ibn Bathoutah*, Paris, 1855, vol. iii., p. 150), "In the middle of the mosque you see an enormous pillar, made of some unknown metal. One of the learned Indians told me that it was what is called *Häsfjâsh*—i.e., "Seven-metals," being compounded of so many different metals. The pillar has been polished on a surface about as long as one's forefinger, and this part shines brilliantly. Iron leaves no mark upon it. Its length is 30 cubits: we encircled it with the cloth of a turban, and found the girth so measured to be 8 cubits.' The Arab's *girth* is greatly exaggerated; so probably his *length* is also an exaggeration of the height above ground, and bears no reference to the actual entire length, which we see to be more than 30 cubits.

"The Pillar is mentioned by Fergusson, *Hist. of Architecture*, vol. ii., p. 460; but he is curiously inconsistent in calling it 'wrought iron,' and then 'a single casting.'

"Yours very faithfully,

"H. YULE."

* As a fact this pillar is actually and constantly polished as hereafter shown.

“ shaft is only 15 feet, the capital being $3\frac{1}{2}$ feet, and
 “ the rough part of the shaft below also $3\frac{1}{2}$ feet (see
 “ Plate 3). But *its depth under ground is considerably*
 “ *greater** than its height above ground, as a recent
 “ excavation was carried down to 26 feet without
 “ reaching the foundation on which the pillar rests.
 “ The whole length of the Iron pillar is therefore
 “ upwards of 48 feet, but how much more is not
 “ known, although it must be considerable, as the
 “ pillar is said not to have been loosened by the ex-
 “ cavation. I think, therefore, it is highly probable
 “ that the whole length is not less than 60 feet. The
 “ lower diameter of the shaft is 16·4 inches, and the
 “ upper diameter is 12·05 inches, the diminution being
 “ ·29 of an inch per foot. The pillar contains about
 “ 80 cubic feet of metal, and weighs upwards of 17
 “ tons.”

With regard, then, to the constitution of the metal of which this remarkable shaft is composed, General Cunningham erroneously describes it as “ cast metal;” and as it does not appear on the face of his report that he personally examined the shaft itself, but probably relied upon what was conveyed to him by others, guided possibly to some extent by the very mystifying and contradictory account given of it by James Fergusson in his *History of Architecture*, vol. ii., p. 460, where the column is described in one line as “ wrought iron,” and in another as “ a single casting,”—it is desirable, nay, really important, to show at once what has been done, with the object of settling whether “ forging” or “ casting” it be. With

* These italics are the author's.—St. J. V. D.

this object a fragment has been cut from the pillar, under the direction of Lieutenant Cole, and not long since sent to England, a portion of which passed into Dr. Percy's hands; and this he (Dr. Percy) not only subjected a part of to analysis, but had another part heated and drawn out under the hammer into a slender nail,* after which he (Dr. Percy) pronounced it to be "forged iron." Strangely divergent, however, from the account given (as already quoted) from General Cunningham's Report, is that which has appeared in the *Journal of the Iron and Steel Institute*,† where, on the authority of Lieutenant Spratt, R.E., said to have been stationed at Delhi, certain statements are published which are utterly contradictory of those given by General Cunningham. Whether in the main General Cunningham's account, or that of Lieutenant Spratt be correct, we are not at present in a position to determine. We are, nevertheless, bound to point out that in dealing with the question, either Lieut. Spratt or Dr. David Forbes, F.R.S., the writer of the Iron and Steel Institute's Report, are at fault in respect of misrepresenting that which General Cunningham really has written. One or other of these gentlemen, in the previous issue of the said journal,‡ represents General Cunningham to have reported, and Mr. Robert Mallet to have repeated, that the above-ground height of the column was 48 feet; whereas in both

* *Architecture of Ancient Delhi, especially the Buildings around the Kutb Minar.* By Henry Hardy Cole, R.E. London: *Arundel Society*, 1872, p. 41.

† Vide *Jour. Iron and Steel Institute*, vol. ii., p. 156.

‡ Vide *Jour. Iron and Steel Institute*, vol. i., p. 151.

Gen. Cunningham's report* and Mr. Mallet's account,† that is the total or collective height of both the above-ground portion and that below-ground, to the depth reported to have been excavated; but now, according to Lieutenant Spratt, the above-ground portion is 24 feet, or 2 feet higher than that portion is reported by General Cunningham, whilst in regard to the below-ground portion, it is not only very short indeed, but of a complex character contrasting strangely and irreconcilably with the description handed to us by General Cunningham. The account to which we now allude reads thus:—"The height of the column above ground is only 24 feet, and 3 feet below ground it ends in a bulb like an onion, which is held in its place by eight short thick rods of Iron, on which it rests, and which at their lower extremity are let into blocks of stone, in which they are secured by lead. The Iron of which it is made, which appears to have been originally in blooms of about 50 lbs. weight each, has been examined by Dr. Murray Thomson, of the College at Roorkee, who found it to be Wrought-Iron, possessing a specific gravity of 7.66."‡

With respect to the material of which the pillar, alleged to be one and the same, to which both the afore-mentioned reports appertain, is composed, they agree; but it is inconceivable that an officer and Archæological Surveyor to the Government of India of General Cunningham's reputation, could be so far led away from facts as to report certainly the

* *Jour. Asiatic Society of Bengal*, vol. xxxiii., art. 65, pp. 34, 35.

† *The Engineer*, vol. xxxii., pp. 403-405.

‡ *Jour. Iron and Steel Institute*, vol. ii., 1872, p. 156.

most remarkable relic of ancient Iron work yet discovered, in the loose and false style he clearly has done, if Lieutenant Spratt's account be the correct one. The discrepancies to which we have directed attention certainly suggest the possibility of two different Iron pillars existing in or near the city of Delhi, and that some confusion has resulted on that account; but as no one seems ever to have heard of more than one such column, and considering the complex character of the forging as it is described by Lieutenant Spratt, we must, in the absence of more precise information—in view, too, of the palpable blunders in the report of the *Journal of the Iron and Steel Institute* as to General Cunningham's statements—and until that information reaches us, prefer General Cunningham's account, as being most probably nearer the truth, and the probability of his report representing the actual state of the case is strengthened by the fact of its accordance with tradition, with which Lieutenant Spratt's account is completely discordant.

Having thus, we trust, judged impartially in respect of the real form of this monument, the next point we have to deal with is the date of its construction. For this, we again refer *first* to General Cunningham's report (Art. 66, *et seq.*), in which he concludes for that event the year 319 A.D.

“ 66. The Iron pillar records its own history in a
 “ deeply-cut Sanskrit inscription of six lines on its
 “ western face. The inscription has been translated
 “ by James Prinsep, who remarks that ‘the pillar is
 “ ‘called the arm of fame’ (*Kirtti bhuja*) ‘of Raja
 “ ‘*Dhava*, and the letters cut upon it are called the

“ ‘typical cuts inflicted on his enemies by his sword,
“ ‘writing his immortal fame.’ It is stated that he
“ subdued a people on the *Sindhu*, named *Vahlikas*,
“ who must be the *Bahlikas* of the Panjâb, and lastly,
“ that he ‘obtained with his own arm an undivided
“ ‘sovereignty on the earth for a long period.’ The
“ above is the whole of the meagre information that
“ can be gathered from this inscription, save the bare
“ fact that the Raja was a worshipper of Vishnu. The
“ date of the inscription is referred by James Prinsep
“ to the third or fourth century after Christ; but Mr.
“ Thomas considers that this is ‘too high an antiquity
“ for the style of writing employed on the monument.’
“ I agree, however, with Prinsep, as the characters
“ appear to me to be exactly the same as those of the
“ Gupta inscriptions. I have already suggested the
“ year A.D. 319, which is the initial point of the
“ Balabhi or Gupta era, as an approximate date for
“ Raja *Dhava*, as I think it not improbable that he
“ may have assisted in the downfall of the powerful
“ Gupta dynasty.

It would appear, however, from M. Garcin de Tassy, who has translated the Persian account of the column by Syud Ahmed,* and who has supplemented that account with some weighty remarks, that the era of the Rajah Dhava was really the 9th or more correctly 10th century B.C., that is from 1200 to 1300 years earlier than General Cunningham had assigned to it in 1861, but that the inscription upon it is of much later date; M. de Tassy concluding equally with Prinsep that the inscription belongs to

* *Les Monuments d'Architecture de Delhi.*—*Journ. Asiatique.* July 1860.

the third or fourth century of the present era, but inscribed by a king long subsequent to its originator, who, indeed, we learn from Indian history, died in the course of its construction. M. Garcin de Tassy states it "is certain" that Midhava (Rajah Dhava) reigned the nineteenth after the epoch Yudhistir,* which epoch he assigns to be 1425 B.C.; and this at the mean rate of 27 years to a generation, brings the exact period of Midhava to 912 B.C.; and he adds, by way of corroboration, that as there is no date upon the pillar, it is evidently before Vikramaditya;† and this view of the matter does certainly help to harmonise the otherwise conflicting statements, for it carries us back to a sufficiently remote period to account for the art, and the memory of the art, by which the Lāht was produced being so entirely lost. Prinsep writes†—

"The language (that is of the inscription on the column) is Sanskrit; the character is of that form of Nagari which I have assigned to the third or fourth century after Christ, the curves of the letters being merely squared off, perhaps on account of their having been punched upon the surface of the Iron shaft with a short *cheni* of Steel."

* Name of the eldest of the five reported sons of Pāndu. Though nominally the son of Pāndu, he was really the child of Prithā or Kuntī, Pāndu's wife, by the God Dharma or Yama, whence he is often called Dharma-putra or Dharma-rāja. As the eldest of the five Pāndavas, he ultimately succeeded Pāndu as king, first reigning over Indra-prastha, and afterwards, when the Kuru princes or sons of Drita-rāshtra were defeated, at Hāstina-pura. This was also a name of a son of Krishna. The word means "firm or steady in battle."—*Sanskrit-English Dic.*, by Professor Monier Williams, p. 819. Ed. 1872.

† The name of several Hindū Kings.

† "Prinsep's Indian Antiquities," vol. i., p. 319.

Prinsep has translated the inscription, which he has rendered literally as follows:—

(1.) “By him who learning the warlike preparations
“and entrenchments of his enemies with their good
“soldiers and allies, a monument of fame, engraved
“by his sword on their limbs, who, as master of the
“seven advantages,* crossing over (the Indus?) so
“subdued the Vahlikas† of Sindhu, that even at this
“day his disciplined force and defences on the south
“(of the river) are sacredly respected by them.”

(2.) “Who, as a lion seizes one animal on quitting
“hold of another, secured possession of the next world
“when he abandoned this, whose personal existence
“still remains on the earth through the fame of his
“deeds. The might of whose arm, even though now
“at rest, and some portions too of the energy of him
“who was the destroyer of his foes, still cleave to the
“earth.”

(3.) “By him, who with his own arm obtained an
“undivided sovereignty on the earth for a long period,
“who (united in himself the qualities of) the Sun and
“Moon, who had beauty of countenance like the full
“Moon; by the same Rajah Dhava, having bowed his
“head to the feet of Vishnu, and fixed his mind on
“him, was this very lofty arm of the adored Vishnu
“(the pillar) caused to be erected.”†

* See the seven metals referred to by Ibn Batuta in Col. Yule's letter, p. 145.

† The Bâhlikas or people of Balkh.

‡ Had we been writing at this place on the hidden or secret meaning of the Iron Lâht, this last part of the inscription would have been found to serve no small purpose in pointing out amongst other things, that its purport has been that of a most famous and sacred Phallus or Lingam—the Supremely Hallowed of Phalli—penetrating according to the tradition deeper than all others into Earth's fecund womb, into the typical Yohni of the Solar-Terrene

There are numerous versions of the tradition as to the pillar penetrating the ground so far as to have touched the King of Serpents, and yet while this tradition has not an immediate bearing on the main point which this book seeks to establish, yet it will eventually be found to touch not altogether lightly on another closely connected matter, we therefore give the account of these varying forms of the tradition as conveyed to us by Cunningham and others.

Lieutenant Cole has the following :—*

“According to local tradition Anang-pâl I. in A.D. 1051, *erected* the pillar when he rebuilt Dilli. A Nagari inscription upon it says that ‘in 1109 Samvat (A.D. 1052) Anang-pâl peopled Dilli.’ One of the local fables is that the Rajah Pithora had the column dug up, although advised to refrain from doing so by the Hindu priests, and that through this act he lost his kingdom to the Muhammadans,” but General Cunningham states that it was Anang-pâl who rooted up this column.

“A learned Brahmin assured the king that as the foot had been driven so deeply into the earth, it rested on the head of Vasuki, the king of the serpents who supports the earth, and that as long as it stood, the dominion of his family would last. Anang-pâl on removing it found the end clotted with

system, the Arch-symbol of generation produced by unison of the Solar and Terrene energies. Its upper or outer part being anointed with oil from the bodies of the devotees, and in more ancient times probably by the Virgins who embraced it, was by the Solar heat caused to flow down into the earth—the receptive Yohni or Womb—thus the pillar itself, and the use made of it typified all that was most sacred to the Aryan worshippers of old.

* Architecture of Ancient Delhi, p. 44.

“ the blood of the serpent king. He, regretting his
 “ want of belief in the words of the Brahmin, had it
 “ replaced, but failed to fix it firmly in the ground.
 “ Thus it remained loose (Hindustani ‘ dhila ’) in the
 “ ground and the name of the city became “ Dhili.”

Cunningham further remarks:—“ This tradition has
 “ been variously reported by different authorities, but
 “ the main points are the same in all. Colonel Tod
 “ states that the iron pillar is said to be resting on the
 “ head of the *Sahas Nâg*, who is the same as *Vâsuki*,
 “ the serpent king. A lady traveller, who visited
 “ Delhi between 1804 and 1814, heard the tradition
 “ in a somewhat different way. A Brahman told the
 “ king that if he could place the seat of his govern-
 “ ment on the head of the snake that supports the
 “ world, his kingdom would last for ever. The Iron
 “ pillar was accordingly driven into the ground on
 “ its present site, under the superintendence of the
 “ Brahman, who announced that the lucky spot had
 “ been found. On hearing this, a courtier, jealous of
 “ the Brahman’s influence, declared that the pillar
 “ was not placed over the serpent’s head, but that he
 “ could point out the true place, which he had seen in
 “ a dream. The pillar was accordingly taken up by
 “ the Raja’s order, and, agreeably to the Brahman’s
 “ prediction, the foot of it was found wet with the
 “ blood of the serpent’s head. This tradition is also
 “ imperfectly related in Purchas’s ‘ Pilgrims,’ on the
 “ authority of English travellers who visited India
 “ during the reigns of Jahângir and Shahjahan.
 “ Purchas states that the *Rase* (Raja) who founded
 “ Delhi ‘ by advice of his magicians, tried the ground

“ by driving an Iron stake, which came up bloody,
 “ having wounded a snake. This the *Ponde* (*Pânde*
 “ or *Pandit*), or magician, said was a fortunate sign.’
 “ In all these different versions of the erection of the
 “ Iron pillar, the main points of the story are the
 “ same, and the popular belief in this tradition is
 “ confirmed by the well-known verse—

“ ‘ *Killî to dhillî bhai,*
Tomar bhaya mat hin.’ ”

“ ‘ The pillar became loose by the Tomar’s folly.’ ”

“ This tradition is related in a more poetical form
 “ by *Kharg Rai*, who wrote in the reign of *Shahjahan*.
 “ According to him, the *Tomar Prince* was provided
 “ by the sage *Vyâs* with a golden nail, or spike, 25
 “ fingers in length, which he was told to drive into the
 “ ground. At a lucky moment, on the 13th day of
 “ the waning moon of *Vaisâkh*, in the *Samvat* year
 “ 792, or A.D. 736,* when the moon was in the mansion
 “ of *Abhijit*, the spike was driven into the ground by
 “ the *Rajah*. Then said *Vyâs* to the King—

“ ‘ *Tum se râj kadi jaëga nahi*
Yih khuntî Vasug ki mâthe gadhi hai.’ ”

“ ‘ Ne’er will thy kingdom be besped,
 The spike hath pierced *Vasuki’s* head.’ ”

“ *Vyâs* had no sooner departed, than the incredulous
 “ *Raja* boldly declared his disbelief in the sage’s
 “ announcement, when immediately

“ ‘ *Bilan De khuntî ukhârî dekhi,*
Tab lohu se chuchâti pikali.’ ”

“ ‘ He saw the spike thrown on the ground,
 Blood-dropping from the serpent’s wound.’ ”

* This date is evidently absurd.

“ The sage was recalled by the horrified king, who
 “ was directed to drive the stake into the ground a
 “ second time. Again he struck, but the spike pene-
 “ trated only 19 fingers, and remained *loose* in the
 “ ground. Once more then the sage addressed the
 “ Raja prophetically, ‘ Like the spike (*killi*) which you
 “ have driven, your dynasty will be unstable (*dilli*),
 “ and after “ nineteen ” generations it will be sup-
 “ planted by the Chohans, and they by the Turkans.’
 “ Bilan De then became King of *Dilli*, and with his
 “ descendants held the throne for nineteen generations,
 “ according to the number of fingers’ lengths which the
 “ spike had been driven into the ground.

“ What was the origin of this tradition, and at what
 “ time it first obtained currency, may never perhaps
 “ be known ; but I think we are justified in hazarding
 “ a guess that the long reign of the Tomar dynasty
 “ must first have led to an opinion of its durability,
 “ which would then have been naturally compared
 “ with the evident stability with which the Iron pillar
 “ was fixed in the ground. We have an exactly
 “ parallel case in the well-known saying about Rome
 “ and the Coliseum—‘ *Quamdiu stabit Colyseus, stabit*
 “ *et Roma : quando cadet Colyseus cadet Roma ;*’ which
 “ the verse of Byron has rendered famous :—

“ ‘ While stands the Coliseum, Rome shall stand ;
 When falls the Coliseum, Rome shall fall.’ ”

“ This, indeed, is the oldest form* of the Indian
 “ tradition that I have been able to trace. When the
 “ Muhammadan conqueror first took possession of

* If this is the oldest it is most important, for the reason that the older the nearer the truth.

“ Delhi, he was informed that the inscription on the
 “ Iron pillar declared that the Hindu rule would last
 “ as long as the pillar remained standing ; on hearing
 “ which, to show his contempt of the prophecy, the
 “ proud victor allowed the pillar to stand. This same
 “ story must have been told to Bishop Heber, but he
 “ has jumbled it up with his account of Firuz Shah’s
 “ Pillar.* That the story which he heard must have
 “ belonged to the Iron pillar is rendered certain by
 “ his referring it to the period of ‘ the conquest of the
 “ country by the Mussulmans.’ About the same time,
 “ also, a similar story was heard by Major Archer,†
 “ who records that ‘ as long as the pillar stood, so
 “ long would Hindustan flourish.’ At a later date, a
 “ similar story was repeated to Mrs. Colin Mackenzie,‡
 “ who says that the Iron pillar bears a Sanskrit inscrip-
 “ tion, ‘ the purport of which is, that as long as this
 “ pillar stands, the *Rāj* or kingdom has not finally de-
 “ parted from the Hindus.’ Lastly, Syud Ahmed relates
 “ that the pillar was driven into the head of *Vāsuki*,
 “ king of the snakes, to make his empire lasting.

“ *If I am right*|| in ascribing the origin of this tradi-
 “ tion to a late period in the history of the Tomars,
 “ when the long duration of their rule had induced
 “ people to compare its stability with that of the Iron
 “ pillar, I think that the saying may be referred with
 “ considerable probability to the prosperous reign of
 “ Anang Pāl II., whose name is inscribed on the shaft
 “ with the date of *Samvat* 1109, or A.D. 1052.

“ The remaining inscriptions on the Iron pillar are

* Journal II., p. 291. + Journal I., p. 121. ‡ *Ibid.*, 2nd edition, p. 46.

|| It seems that General Cunningham cannot be right, however.—St. J. V. D.

“ numerous, but unimportant. There are two records
 “ of the Chohan Raja, *Chatra Sinha*, both dated in
 “ Samvat 1883, or A.D. 1826. They state that the Raja
 “ was descended from *Prithivi Raja* in 29 generations,
 “ which is quite possible, although the period allowed
 “ for each generation is under 23 years. The date of
 “ Prithivi Raja is given as Samvat 1151, or A.D. 1094,
 “ which is just 99 years too early, an amount of error
 “ which agrees with the false dates in the *Prithi Rāj*
 “ *Chohan Rāsa* of the Bard *Chand*. There is also
 “ another modern Nagari inscription of six lines, dated
 “ in Samvat 1767, or A.D. 1710, of the Bundela Rajas of
 “ *Chānderi*. Below this there are two Persian inscrip-
 “ tions, dated in A.H. 1060 and 1061, or A.D. 1651-52,
 “ which merely record the names of visitors.”

With further respect to this column, several writers appear to have confounded it with the stone column, known as Feroze Shah's Lâht*—described in the *Asiatic Researches*, vol. i., 4to ed., p. 371, as the following will show:—

“ At ancient Delhi,” says Bacon, “ there is an
 “ extraordinary pillar, apparently metallic, but in
 “ reality of red sandstone, bearing a silvery bed in it,
 “ now called Feroze Shah's Lâht, or walking stick.
 “ *Thirty feet of it are above ground, and buried many*
 “ *feet in the earth.* There is one exactly similar to
 “ this at the Cootub Minar, and another at Allahabad.
 “ All are supposed to be of the same origin, but their
 “ history is quite lost in obscurity. They are covered
 “ with inscriptions.† Forrest‡ mentions that this


* See Bishop Heber, *ante* p. 157.



† Bacon's “Studies in Hindostan,” vol. ii., p. 315. ‡ “Jumna and Ganges.”

“pillar at the Cootub* Tower is of solid Iron, and
“that the whole temple is a subject of great doubt
“and incertitude.”

Close by the Cootub (“Cootub” means the “North
“Star”) stands a remarkable Pillar of a single cast

* As a curious connexion, and one which close investigation may prove pervaded with significance, we may contrast the names of the Cootub or “Kutb,” and “AL-Kutub,” which Sir William Drummond, when writing of the antiquity of the mariner’s compass, says is the name of the Polar Star in Arabic. There would thus appear to be something of relation to MAGNETISM in this word and, of course, in view of the religious import of the Lāht, the symbol to the early Aryan mind of what was most sacred and attractive, we may recognise the correspondence of union between it and the fecund power it typified and its devotees, answering to the Magnetic attraction between the pole and the compass needle. While speaking of the Magnet, it is not unimportant to point out that it seems to be compounded of the name of the God Agni—the God of fire, heat, light, &c.—the product of the heat of union of the sacred Suastika (probably equivalent to the *śūktā*; as Schliemann has pointed out, or sign of good wishes with the Greeks) and Pramantha (also probably equivalent to the Greek Prometheus), the God of love, of glory, brightness—the chief attraction before which the Sun and Moon grow pale, and therefore the MAGNETIC God. The Magnet being in short the type or symbol of his attractive essences or attributes embodied in the Iron, which as the one substance pre-eminently influenced by and retaining magnetic attraction is in its Coitus when under magnetic influence physically the “Hieron-Ikon” or correspondence of the Spiritual world according to the Law of Spiritual Attraction.

Of the generation of the God Agni by the coitus of the  Suastika (female) and the Pramantha, lance (male), M. Emile Burnouf has recently published the following interesting account,* which has been rendered into English by Dr. Schliemann†:—



“The  represents the two pieces of wood which were laid crosswise
“upon one another before the sacrificial altars in order to produce the holy fire
“(Agni), and whose ends were bent round at right angles and fastened by
“means of four nails, , so that this wooden scaffolding might not be
“moved. At the point where the two pieces of wood were joined, there
“was a small hole (*yohni*), in which a third piece of wood, in the form of a
“lance called Pramantha (Lingam),‡ was rotated by means of a cord made

* La Science des Religions.

† Troy and its Remains, p. 108, *et seq.*

‡ From the Sanskrit *pramath* or *pramanth*—to stir about violently, to agitate, to churn—and from which view the origin of the symbolism is obvious. Gni, or Gna, in Sanskrit,

of Wrought Iron, about 17 tons weight, 50 feet high, and more than half in the ground. It has not a speck of rust, although, from the inscription, it was set up in

" of cows' hair and hemp, till the fire was generated by friction. The father
 " of the holy fire (*Agni*) is Twastri—i.e., the divine carpenter, who made
 " the  and the Pramantha, by the friction of which the fire was pro-
 " duced. The Pramantha was afterwards transformed by the Greeks into
 " Prometheus, who, they imagined, stole fire from heaven, so as to instil into
 " earth-born man the bright spark of the soul. The Mother of the holy fire
 " is the divine Mâjâ, who represents the productive force in the form of a
 " woman: every divine being has its Mâjâ. Scarcely has the weak spark
 " escaped from its mother's lap—that is, from the  which is likewise
 " called Mother, and is the place where the Divine Majâ—when it (*Agni*)
 " receives the name of child. In the *Rigvēda* we find hymns of heavenly
 " beauty in praise of the new-born, weak, divine creature. This little child
 " is laid upon straw; beside it is the mystic cow—that is, the milk and butter
 " destined as the offering; before it is the holy priest of the divine Vâju, who
 " waves the small oriental fan, in the form of a flag, so as to kindle life in the
 " little child, which is close upon expiring. Then the little child is placed
 " upon the altar, when, through the holy 'soma' (the juice of the tree of
 " life) poured over it, and through the purified butter, it receives a mysteri-
 " ous form, surpassing all comprehension of the worshippers. The child's
 " glory shines upon all around it; angels (*dēvās*) and men shout for joy, sing
 " hymns in its praise, and throw themselves on their faces before it. On its
 " left is the rising Sun, on its right the full Moon on the horizon, and both
 " appear to grow pale in the glory of the new-born god (*Agni*), and to worship
 " him.* But how did this transfiguration of *Agni* take place? At the
 " moment when one priest laid the young god upon the altar, another poured
 " the holy draught, the spiritual 'soma,' upon its head, and then immedi-
 " ately anointed it by spreading over it the butter of the holy sacrifice. By
 " being thus anointed, *Agni* receives the name of the Anointed (*akta*). He
 " has, however, grown enormously through the combustible substances; rich
 " in glory he sends forth his blazing flames; he shines in a cloud of smoke,
 " which rises to heaven like a pillar, and his light unites with the light of the
 " heavenly orbs. The God *Agni*, in his splendour and glory, reveals to man
 " the secret things; he teaches the Doctors; he is the Master of the masters,
 " and receives the name of *Jātavēdas*—that is, he in whom wisdom is inborn."

is also "wisdom," and the name of a semi-divine or superhuman female—a kind of goddess or female genius—whilst *Agni-Kunda* is the name of the hole for receiving and preserving the consecrated fire. This is not the place to expose the recondite depth of primitive Aryan words and symbols, more especially proper names, but perchance some reader may perceive the hidden, yet scarce hidden, meaning.—St. J. V. D.

* He thus has become the centre of attraction; MAGNET, MAGNate,—that which is MAGNificent, and MAGNified, the symbol or type of the Agnus Dei.

the sixth century. Now Dr. Macleod's cicerone stopped there, but *since* informed me gravely that there was no doubt whatever that the World turned round upon the Pillar (Iron Axis), and that the *other end* stuck out at the Antipodes of that exact spot. The guide added that he knew it for a fact.*

A learned correspondent, too, writes us in respect of this Iron column:—"The inscriptions thereon are " of very *different dates*. Some, the most ancient, in " the Nagari letters, others in Sanskrit, all prefaced " by the mystical Holy Invocation, O'M. The events " engraven involve very great periods,—thus one is " decidedly the 'year of Christ 67 (by computation).'"

In the midst of such conflicting or rather confused testimony, which is all we yet possess, we conceive it would be unwarrantable to attempt to fix the date of this remarkable work, albeit that the strength of evidence so far serves to favour the older date, viz., the ninth or tenth century B.C., whilst the very vagueness of the several accounts is such as to point out the hoary period to which the work belongs; for had it been a production of comparatively late times, it would certainly have had attached to it a somewhat decided history, which doubtless would have been capable of proof or disproof by contemporary monuments or history. We shall, however, touch upon other evidence in the sequel proving the high antiquity of Iron and Steel working in India. The utmost, then, at which we can now arrive is, that its antiquity is very considerable—this conclusion being arrived at not only by reason of the absence of

* "Travels Retravelled," by Lady Barker. 1872.

any precise generally current information regarding it, but judged of also from the universal testimony throughout the East, both in material as well as literary relics and traditions of a very remote and contemporaneously very high intellectuality there prevailing.

As to how this remarkable forging was produced, some have been bold enough to conjecture.* For the present we abstain from offering an opinion; but as a suggestion indicating what may be at least a possible mode, in which large masses of iron were produced in ancient times, we may refer to the account presented to us by Mr. Alfred Russel Wallace,† of the manner of producing the "sacred krisses"‡ in the island of Lombock. This was effected at the taking of a census, by the Rajah commanding a needle to be brought to him for each head of the population. These needles were collected by the chiefs in the various villages and towns, and a bundle sent from each to the Rajah, which contained a number of needles corresponding to the numbers of the people; and "when it was quite certain that every village had sent in its bundle, the Rajah divided the needles into twelve equal parts, ordered the best steel-worker in Mataram to bring his forge, and his bellows, and his hammer to the palace, and to make the twelve krisses under the Rajah's eye, and in the sight of all men who chose to see it." Whether, then, the Iron column at Delhi is the result of taking a census, after the manner adopted by the Rajah of Lombock, we must leave

* See Appendix B.

† The "Malay Archipelago." Macmillan & Co., London, ed. 1869, p. 284.

‡ The "Kris" is a cutting weapon used by the natives of Lombock.

others to determine; but that it is a monument in connexion with some high religious belief and practice, no one, we presume, would attempt to question, and the proof of this it may be our duty at some future period to unravel.

Mr. Mallet, after carefully reviewing the evidence as to whether this huge specimen of ancient Iron work be a casting or a forging, says :—

“ We are thus obliged to consider that this pillar is “ *not a casting*, but is a huge forging in native Indian “ or some other Asiatic-made *wrought Iron*, and if so, “ the question arises how was it forged? We have no “ evidence that ‘blooms’ of more than 90 lbs. or 100 “ lbs. each were ever made by Indian methods; these “ would be too small to build up singly into a bar of “ 16 inches diameter. It is, however, conceivable that “ such little ‘billets’ as were procurable from such “ blooms might be welded up into bars, and these “ bars made into a faggot, out of which such a bar, “ by *sufficient means* for bringing it to a welding heat, “ and for then hammering it, might be welded into a “ cylindrical bar such as that of this Iron pillar.

“ Now the limit to the size of a faggot that can be “ welded with given means of *heating it*, is found to be “ when the mass is so great in proportion to the “ power of the furnace that the exterior of the mass, “ where the heat is being applied, oxidises and melts “ away, owing to the slowness of heating, and hence “ long continuance of exposure to the heat, as fast as “ piece after piece is laid on to make up for the waste. “ This limit has been reached before now even in our “ best reverberatory forge furnaces; it actually was

“ touched upon at Liverpool, in forging the Mersey
“ Company’s great 13-inch gun. Unless, therefore,
“ the iron workers of India between the third and
“ fourth centuries, A.D.,* possessed air furnaces and
“ lofty stalks, or blowing apparatus of some sort upon
“ a scale now unknown, and, indeed, not conceivable
“ in any form of native apparatus, we may confidently
“ affirm that no faggot to form a welded bar of 16
“ inches diameter could have been by any possibility
“ brought to the welding heat at all, or without such
“ waste as to prevent its ever being forged.

“ If we pass from the heating of such a bar to the
“ forging of it, our difficulties are still greater. The
“ limit in size of *hand forged* work in Europe was
“ about reached in the production in days gone by of
“ the heaviest ‘best bower’ anchor of a ship of the
“ line. The largest section of the anchor shank when
“ welded to the arms was about 8 inches or perhaps
“ 9 inches across, and the welding was effected by the
“ blows of twenty-four ‘strikers’ trained to strike in
“ time, and swinging 14 lb. to 18 lb. sledges. The
“ shower of blows dealt for some minutes’ spell upon
“ the mass of Iron of this large section produced a
“ very insignificant effect, so that both the faggoting
“ and the welding of such anchors were often very
“ defective, and the strikers having to stand close in a
“ ring, within the short distance for swinging the
“ sledge from the glowing iron, were greatly scorched
“ by its radiated heat, and some with fine skins were
“ unfitted for the work. Hereabouts, then, the limit

* This, as we have seen, *ante* pp. 151-2, is much too recent a date.—
St. J. V. D.

“ to hand forging was reached, both as to the power
 “ of the hand sledge to act upon the mass of Iron,
 “ and as respected the power of the men to endure the
 “ heat radiated from the glowing Iron at the short
 “ distance from it, limited by the length of the handle
 “ of a sledge when swinging. Now the section of the
 “ shank of a ‘best bower’ of 8 inches or 9 inches
 “ diameter is to that of the Delhi iron pillar about as
 “ 64 to 201, or the latter would radiate from its
 “ heated extremity more than thrice as much heat, and
 “ in an equal length there is more than thrice as great
 “ a mass to be dealt with by the sledge hammer, as in
 “ the case of the anchor. We may therefore affirm
 “ that, even in European hands, a bar of wrought
 “ iron of 16 inches diameter could not be welded up
 “ by hand labour with the sledge. The latter would
 “ produce no adequate impression—least of all in the
 “ comparatively feeble hands of Asiatics*—and human
 “ skin and muscles could not withstand, at 5 feet or 6
 “ feet off, the intolerable glare and scorching of such a
 “ mass heated to the welding point. How then was
 “ this Delhi pillar forged in India, even assuming that
 “ some means for heating it existed? Forging by
 “ power in some form, of course, suggests itself, but
 “ upon what source of power can we even speculate?

* Here, unfortunately, Mr. Mallet falls into the popular error of assuming that the present condition of a race, and the present condition of a technical art, are what they were in remote ages—say two or three thousand years ago. To take a parallel: the very construction and reduction to grammatical system of a language—viz., the highly-polished Sanskrit at so remote a period, is a proof of the vigorous intellects that in early times peopled India. It must, however, in justice be said that Mr. Mallet yields this part of his position further on (*vide post.* p. 170).—Sr. J. V. D.

“ Human muscles, and the ‘ bullock walk ’ by which
“ the water skins, or ‘ bheesties,’ are drawn up from
“ the wells or tanks, appear the only present sources
“ of power in India. The water wheel, or *noria*, for
“ raising water by the application of such animal
“ power, is common ; but the production of power by
“ the descent of water on a wheel seems never to have
“ been known in India, where, indeed, except in the
“ hill districts, no ‘ falls ’ for water-power exist. The
“ windmill, though said to have been known in Persia
“ from some very remote period, has never been seen
“ in India, and it need scarcely be said steam-power
“ is out of the question.

“ It is barely imaginable that some form of falling
“ tup hammer raised by men acting on ropes, after the
“ manner of the old ringing engine for pile driving,
“ may have been employed, or some rude form of tup
“ or tilt hammer moved by bullocks acting on a walk-
“ ing wheel ; and it is for Indian archæologists to
“ discover if there be any records or traditions of such
“ appliances, without which the methods by which
“ this huge pillar was forged must remain inexplicable.
“ The pillar itself stands before us, so far, a metal-
“ lurgic enigma. If it stood alone, and were this
“ great ancient forging in wrought iron alone known
“ to exist in India, we might pass it by, content to
“ suppose it too isolated an instance on which to found
“ any conclusions as to the iron metallurgy of that
“ country in former ages ; but, although little noticed,
“ and apparently quite unknown to our European writers
“ on iron metallurgy, this pillar does not stand alone.
“ Not to lay any stress on the probable existence in

“ India of *other* iron pillars, as affirmed to the writer
“ by an accurate Indian officer well acquainted with
“ the country, the following facts are recorded by Mr.
“ James Fergusson, in his ‘Illustrations of Ancient
“ Architecture in Hindostan,’ fol., London, 1848, p.
“ 28, and plate 3.

“ In the temple of Kanaruc, or Black Pagoda, in
“ the Madras Presidency, ‘the walls of the *mantapa* or
“ ‘porch (which is about 60 feet square inside) are
“ ‘about 10 feet in thickness, and the depth of the
“ ‘doorways is, consequently, 20 feet, and their lintels
“ ‘are supported by *large iron beams of about 1 foot*
“ ‘*section*, laid across from side to side. The roof is
“ ‘formed after the usual bracket fashion of the Hindus,
“ ‘each course projecting beyond the other, so as to
“ ‘give (from the inside) the appearance of inverted
“ ‘stairs. . . . At about half the height, where
“ ‘its dimensions narrow to about 20 feet, a false roof
“ ‘has been thrown across, the remains of which now
“ ‘lie heaped up as they fell on the floor of the apart-
“ ‘ment. Among them may still be remarked *several*
“ ‘*beams of wrought iron about 21 feet in length and 8*
“ ‘*inches section*, and a great many blocks of stone, 15
“ ‘feet and 16 feet long (and they were probably broken
“ ‘in their fall), and of a section of 6 feet by 2 feet or
“ ‘3 feet.’ Here, then, we have employed as mere
“ building material wrought-iron bars of 8 inches square
“ and 21 feet long. Mr. Fergusson views this temple
“ as having been built between A.D. 1236 and 1241.*

* But then the author must caution his readers that Mr. Fergusson’s dates are not to be relied on, however important his writings unquestionably are in other respects.—ST. J. V. D.

“ In another temple examined and described by Mr. Fergusson—that of Mahavellipore, standing alone on a solitary rock of granite projecting into the very surf on the coast, near Madras, and the date of which he refers to the tenth or eleventh century, A.D.; but deems may be as late as the thirteenth or fourteenth century, and described in his great work as above, p. 57, and plate 18—he informs me there are empty sockets for beams like those just noticed. The beams, he justly argues, must have been of iron, as the sockets show a scantling, which would have been, if in timber, perfectly useless under the load carried.

“ Fig. 13 shows, in mere diagram section, the general construction of these *Vimana's* and the position of the iron beams referred to in both the above cases. It is highly probable that at Kanaruc the ceiling beams thrust themselves out of their sockets by alternate expansion and contraction, and so brought down the ‘false roof,’ as the filling above is called; but the place affords a bad foundation, and is said to be subject to earthquakes. However, our business with these iron beams is simply as metallurgic monuments. Here, then, we have the fact that at Delhi, in the north, and at Madras, in the far south of India, massive forgings exist, such as all Asia, so far as we know, could not produce at the present day, and of a size rivalling those upon which Europe to-day prides itself. The earliest of these dates from the third or fourth century,* and the latest from

* We have already seen this to be erroneous, the true period being the ninth or tenth century B.C.—St. J. V. D.

“ the eleventh to the fourteenth centuries of our era.
 “ With such an interval in time as 900 or 1000
 “ years,* and such a diffusion in space as from north
 “ to south of India, it seems impossible not to con-
 “ clude that the evidence of these monuments attests
 “ the existence in India for that long period of a great

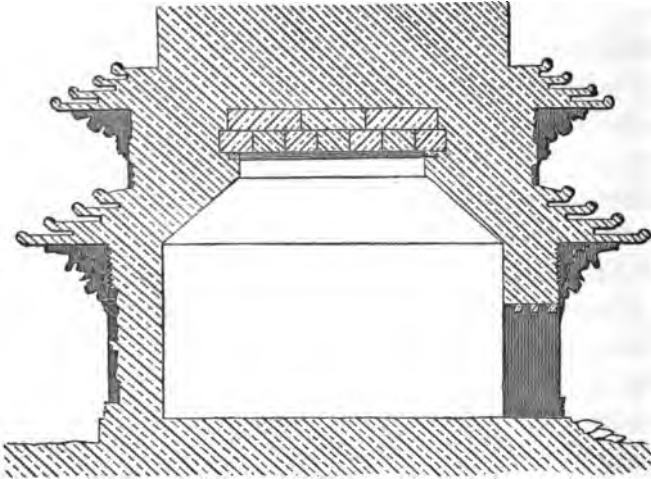


Fig 13.

“ *Iron manufacture*, well established, and with a rela-
 “ tive cheapness and certainty of product that ad-
 “ mitted of the use of Iron as a material for public
 “ monuments and as a building material in sacred
 “ edifices, and that this manufacture was extinct, and
 “ the art and methods lost, long before any modern
 “ European occupation of India. So that far from
 “ Indian Iron working having been the same feeble
 “ thing we see it to-day from time immemorial, it was
 “ once a great and flourishing craft, and extended
 “ over parts of the entire Indian peninsula.

* The interval is most likely about 2300 years.—St. J. V. D.

“ Nothing heretofore brought to light in the history
“ of metallurgy seems more striking, to the reason as
“ well as the imagination, than this fact: that from
“ the remote time when Hengist was ruling in Kent,
“ and Cerdic landing to plunder our barbarous ances-
“ tors in Sussex, down to that of our Third Henry,
“ while all Europe was in the worst darkness and con-
“ fusion of the Middle Ages—when the largest and
“ best forging producible in Christendom was an axe
“ or a sword blade—these ancient peoples of India,
“ the forerunners of those now so enfeebled and
“ degraded, possessed a great Iron manufacture,
“ whose products Europe even half a century ago
“ could not have equalled.

“ Yet these conclusions rest on no *new* facts, but on
“ the colligation of old ones, by the light of practical
“ knowledge. Indian archæologists and writers have
“ long known of the existence of these Iron monu-
“ ments of an ancient and lost art in India, but their
“ importance has, the writer believes, not before been
“ recognized as bearing on ancient oriental metallurgy.
“ The reason of this is that those who have examined
“ the monuments of India, however scholarly and
“ able in many ways, have not been metallurgists,
“ and have had no practical knowledge of Iron work-
“ ing. The ancient, and, indeed, the existing tech-
“ nology at large of India—still more of Asia at large
“ remains almost unexplored and undescribed, and
“ whenever it shall be examined, analysed, and
“ described by really competent men—and such have
“ never yet been commissioned with the task—results
“ even more strange, and perhaps of more importance,

“ historical and practical, than these deducible from the Delhi Iron pillar, will, no doubt, come to light.

“ Since the foregoing was in type a notice has appeared in *Les Mondes* (tome xxvi., Dec. 1871), by M. Sévoz, an engineer of mines, resident in Japan, of the Iron-working districts of that country, which may throw some light on the conjectured modes by which these great forgings may have been effected by human power in these remote ages in India. In reference to the mode of Iron-working in the mining province of Ykouno, M. Sévoz says:—‘ The treatment employed is a sort of imperfect Catalan method, . . . but what distinguishes the Japanese method from that of (Depart.) Ariège is that they treat at once 16,000 kilos. of ore, and produce an enormously long bloom of 1,300 kilos., which is broken up under a huge hammer, constructed after the style of a pile-driving ram, to which motion is given by a walking wheel of 11·5 metres diameter, acted upon (montée) by men. One can see that potent blows may thus be given, but their frequency and regularity do not seem such as thus to admit of a forging being produced, even if the means for heating a mass as huge as those referred to were capable of being guessed at.’”*

* Iron is now produced in Japan by ancient methods cheaper than in England by modern methods. At the meeting of the Literary and Philosophical Society of Manchester, held March 4th, 1873, “Mr. Brockbank exhibited specimens of Iron manufactured by the old Bohemian process from hematite ore in the south of Europe. Similar Iron had also recently been sent to England from Japan; the high prices now ruling having attracted supplies of Iron from distant countries.

“ Finished bar Iron is produced at the present time in countries where labour is cheap and charcoal plentiful at an exceedingly low price as com-

Yet before passing on from the famous Låht, we take occasion to insert the following excellent remarks of a learned correspondent, although not quite in the words of the original:—None of the theories propounded, with reference to the nature of the material, is sufficiently decisive to be satisfactory. They all start from the assumption that the makers of the column were ignorant of all scientific method, and had possession only of rude and primitive means and appliances. This assumption is directly contradicted by the *present* condition of the arts in India. The textile manufactures, the work in the precious metals and jewellery, the painting, the exquisite refinement of carving in wood, Ivory, and tortoiseshell, no less than the inimitable inlaid work as now existing, are palpably only a Degenerate Tradition of still higher skill and methods in use long ages ago, and point no less distinctly to a condition of higher knowledge than to the possession of more refined technical methods and processes than are now found. It is, therefore, plainly illogical to assume that the Proto-Indians were merely rude and ignorant strainers after a technology which was completely beyond their ken and apprehension.

There is at least this unanswerable fact, which no

"pared with the present values in England. The specimen now exhibited
 "cost only £8 per ton for the bloom, and £8 per ton for the finished bar.
 "The size of the bars are, however, very small; but it is a remarkable fact
 "that on so small a scale *Iron of the very highest quality* can be made and
 "sold at half the price of English bars made on the largest scale, with all the
 "advantages of our modern machinery and appliances. It is believed that
 "the Iron is made by a similar process to that followed by the Romans in
 "Britain, the remains of furnaces or 'bloom ores' in Ernudah Lake being of
 "this class."—*Mcm. Lit. and Phil. Soc., Manchester, 1873, p. 72, 73.*

theories can damage, to wit—that with all *our* boasted science and technic advance, we cannot do what they *have done* ages ago; and we are, moreover, completely puzzled to understand in the least *how* they did what they have done.

Lastly, it is nothing short of preposterous to suppose that the men whose common vernacular was the highly-refined and polished Sanskrit (by the side of which Latin is barbarous), were rude, ignorant, and emerging principally from a condition of barbarism. Primitive, in the true high sense, they may no doubt have been, and their civilization of an essentially different order from the elaborate and complicated system of material and sensuous appliance which *we* call “Civilization.”

The probabilities are that they were, indeed, already degenerated in Science—knowledge of the Secrets of Nature—from the position which day by day we see already was occupied by the “Ancient Ones of the “Earth.”

It has been said that this remarkable column, although exposed to the open air, does not rust, and the local belief still is that the column is not Iron, but, as we have previously seen, an alloy of seven metals. That it is Iron, however, we now know for certain from the examination of the material by Dr. Percy, through the application thereto of tests which chemical and mechanical science prove unerring. Yet it is not long since Dr. Percy expressed his inability to account for the non-rusting of the column. He writes us, “In spite of the dews of India, the column does not “rust.” Lieutenant Cole, on the other hand, after

watching for some time all that goes on in the neighbourhood of the column, is enabled to show that a constant habit of those who make pilgrimages to it at once and most completely accounts for this fact. Lieutenant Cole remarks:—“The dryness of
“the air at Delhi is the principal circumstance,
“probably, to which is due the preservation of
“the Iron pillar. During the hot season rain falls
“rarely, and during the rains which last for some
“three months after June, the temperature is high,
“and the heat readily disperses the moisture which
“may be generated upon the column, on account of
“the good conductive quality of the Iron. During
“the cold season, the air is, for the most part, very dry,
“and an occasional shower of rain soon evaporates.

“A circumstance which may appear to many of
“minor importance, from which I am inclined to
“believe that the Iron derives a species of artificial
“protection, is that the native visitors have a habit
“of embracing the pillar with their naked arms, and
“of climbing up to the top.† If man or woman can

* *Architecture of Ancient Delhi*, 1872, p. 41, *et seq.*

† The male section of the Western Indo-European peoples (our own Anglo-Saxon selves, for example) degenerated from an idea pure at its origin; and, having carried down consciously but an infinitesimal portion of our traditions, however much unconsciously, still practice what has come to be viewed as the sport, of climbing a greasy pole, as an act of prowess on occasions of public festivity, whilst our maidens, at a certain period of the year, decorate the pole with those coloured insignia, the hues of which are collectively embodied in the constitution of Light, which in connection with heat emanating from the great productive male power of nature—the Sun—constitutes the eternal fructifying agency of the physical world. This is done by the gay and happy maiden on the first of May,* the Queen† month of spring,

* See the Sanskrit Mājā, Mother of the Holy Fire, representing the female fructifying force; also, note *ante*, p. 161.

† See the ancient Irish words COINNE, COINNT, &c.

“ make their hands meet round the column with
 “ *backs* placed close to it, they are considered to have
 “ indisputably established their legitimate birth. As
 “ natives of both sexes continually cover the whole of
 “ their bodies with oil, as a protection against the
 “ power of the Sun’s rays, it somewhat oddly occurs
 “ that the rusted surface is kept in a state of polish
 “ in a manner which, in its results, is similar to the
 “ protective measures taken in the present day in
 “ dealing with the polished surfaces of steel guns.
 “ Sir Joseph Whitworth frequently rusts the surface
 “ of his guns, and polishes them with oil, in order to
 “ prevent the spread of oxidation.* The colour of the
 “ rusted surface of the column has an appearance like
 “ bronze, to which fact is probably due the general
 “ local belief that the metal is of a mixed composition,
 “ and not of pure Iron.

when the fructifying force of nature is in full activity, dispensing growth, delight, pleasures to all ; and, lastly, she decorates (encircles) the pole with rings (coronæ) of flowers in full bearing, and buds ready to mature and bring forth. In ancient times she decorated that pole with bells, “the tokens of “virginity,” on which so much stress was laid. In short, we Westerns have troubled ourselves next to nothing as to the origin and truly recondite character of most of our commonest practices, many of which, to our shame be it said, we, in our luxury of ignorance, affect to despise. Be it so; but when we examine the etymology of this word “Pole” or “Pillar”—thus, Saxon, *Pol* or *Pal*; German, *Pfahl*; Danish *Paal* or *Pol*; Swedish *Pale*; Welsh *Pawl*—we arrive at the Latin *Palus*, which, besides signifying a pole or stake, is also the *Membrum Virile*—the *φαλλος* of the Greeks, Mahadeva or the Linga of the Hindus, Bel or Baal of the Chaldeans, Yakhveh of the Canaanites, Ti Mohr of the ancient Irish, and Teih-mo* of the Chinese, etc. (See Appendix C.)—
 St. J. V. D.

* This, however, is a much commoner practice than Lieutenant Cole seems to suppose, and is an expedient often resorted to with the connecting rods and shafts of steam engines, and well finished parts of machinery.—
 St. J. V. D.

* The chief idol in the Chinese Junk is an upright rod of Iron-wood.

“ In spite of its plain character, this column attracts by far the greatest number of the native visitors to the ruins. During the progress of my work, which proceeded close to it, I frequently noticed large parties of native visitors come and go, having given their undivided attention* to the Iron pillar, and to nothing else, in spite of the beauty and attractiveness of the surrounding buildings. The tradition about this pillar having rested on the head of the snake-god is still a local belief, and is the reason of its popularity.”

Whilst speaking of India, we must not, however, pass over that unique collection of archaic Iron and Steel tools which Colonel Pearse, R.A., found in excavating some tumuli at Wurree Gaon, near Kamptee, in India, which tumuli are believed to date from about 1500 B.C., or the time of Moses; or many centuries earlier than the oldest traditional date respecting the Lâht of Delhi.

Colonel Pearse has presented his “find” to the Trustees of the British Museum, and we lately were fortunate in receiving from Colonel Pearse himself, and in their presence, a full explanation of the several implements, as well as the conditions under which he found them. The “find” includes gouges, spatulæ, ladles, and a variety of other articles, which, like the old saw and pick from Assyria, testify that in the matter of form of tools we have not gained a step since these the earliest known examples left the hands of their fabricator, from 800 to 1500 B.C., or, that is to say, somewhere near 3000 years ago. Whether man has since succeeded in making better tool-steel we cannot answer, for that does not follow *pari passu*

* See note *ante*, page 153.

with the finding out of methods for producing, in greater quantity, a material for which, with increase of population and other causes, there is an increased demand. It is probable that there has never been better tool-steel than the Indian Wootz known.*

The table at the end shews, from the evidence of language, that Iron was known amongst the Indians in the very earliest times up to which it is possible to trace their existence.

* *Hindoo Process*.—"According to Mr. Josiah Marshall Heath, *wootz*, or Indian Steel, is prepared from Iron, made in the ordinary Hindoo furnace, by fusion in crucibles made of refractory clay, in which is placed, together with the metal to be converted, a certain portion of finely-chopped wood, for which purpose that of the *Asclepias gigantea* or *Cassia auriculata* is preferred. The quantity of Iron put into each crucible does not usually much exceed a pound in weight, and, after covering the pots with one or two green leaves of the *Convolvulus laurifolius*, they are closed with a little wetted clay, and placed in the sun to dry.

When the clay plugs have become sufficiently hardened, from twenty to twenty-four of these crucibles are built, in an arched form, on the bottom of a small blast-furnace, and strongly heated during from two to three hours with a blast produced by two bellows, each made of a bullock's hide. At the expiration of this time the conversion is considered to be completely effected; the furnace is then allowed to cool, and the crucibles are removed and severally broken, when the Steel is found in the form of a rounded button occupying the bottom of each pot.

The cakes of Steel thus obtained are prepared for drawing into bars by exposing them, during several hours, in a charcoal fire to a temperature slightly below their melting point. The fire is urged by bellows, and the cakes are turned over before the blast; from this circumstance Mr. Heath arrives at the conclusion, that in order to insure complete fusion of the contents of the crucibles, the addition of a large excess of carbon is necessary, and that this excess in the too-highly carburised Steel is oxidised in the way above described.

The following analysis of wootz is by the late Mr. T. H. Henry; the specimen operated on was in the shape of a bar, 4 inches long and 1 inch square, weighing 4,760 grains:—

C,	{ combined,	. . .	1.333	As,	0.037
	{ uncombined,	. . .	0.312	Fe, by difference,	98.092
Si,		0.045			
S,		0.181			100.000"

Phillip's Metallurgy, p. 317.

CHAPTER VII.

CHINA.

LET us now then turn from those regions of the Old World, which are comparatively near, to those which are easternmost and vastly further removed from our ability to investigate. In a former chapter we drew attention to the extreme scantiness * of our information respecting the state of the mechanical arts in China in very ancient times, but the labours of the Tsinologues in unravelling to the European mind the riches of that store of highly archaic literature which China possesses—a secular literature certainly as old, in all probability very much older than what is to be met with in any other country, asserted indeed to be at least 500 years older than the Hebrew Scriptures, and about 1500 years older than the earliest cuneiform tablets whose date is yet fixed †—have at last dispelled all doubt on the question, whether in China the use of Iron was known in pre-historic times. But this is not all, for in the most ancient Chinese writings mention is made of Steel, and Leih-Tze, an author who flourished about 400 B.C., describes the process by which it was made.

* *Ante*, pp. 143, 4.

† It is worthy of remark that of all the numerous cuneiform tablets which have been found, there is not one so far, professing to be an original document; all of them are copies, and some copies of copies. See George Smith's Chaldean Account of Genesis, &c.

The oldest, and indeed the only Chinese word for Iron is 鐵 = *tie*: old sound *tit*. It is mentioned in the list of articles of tribute—in the Yu Kung section of the Shoo King,* Book I., the tribute of Yu.

The following is the passage in which it occurs:—

“The articles of tribute were musical gem stones, Iron, silver, Steel, stones for arrowheads, and sounding stones, with the skins of bears, great bears, foxes, and jackals, articles woven with their hair.”

In a note Mr. Legge adds, “by 鐵 = *tie*, we are

“to understand ‘soft Iron,’ and by 鏤 *low* or *lowe*, “‘hard Iron’ or ‘Steel.’ The latter article is often “used for ‘to cut’ and ‘engrave,’ with reference to “the hardness of the tools necessary for such a purpose. In the time of the Han dynasty, ‘Iron “‘masters’ (鐵官) were appointed in several districts of the old Leang-chou, to superintend the “Ironworks. Ts’ae refers to two individuals mentioned in the ‘Historical Records,’ one of the “surname Ch’o (卓氏), and the other of the “surname Ch’ing (程) both of this part of the “Empire, who became so wealthy by their smelting “that they were deemed equal to princes. 銀 “is the white metal or silver.”

* See Legge’s “Chinese Classics,” vol. iii., pt. i., p. 121. Trübner, London, 1865.

We are informed by the Rev. Dr. Edkins of Pekin, that with the exception of this passage there is probably no distinct allusion to Iron in writings older than 1000 B.C. The Book of the Shoo King is estimated as having been compiled about 2000 B.C., or at a time when in Egypt hieroglyphic tablet-writing flourished, and centuries before a Greek nation had begun to sensibly exist.

The place where the Chinese worked Iron in these most ancient times was at Shansi and Chilili, in the Ho district, where there are inexhaustible deposits of both Iron ore and coal, where, too, they have continued to work Iron to the present day; indeed but a few months ago * a Commissioner of Li-hung-chang, the Governor-General of Chilili, and minister of the young King of China, was in this country commissioned to take out new appliances and apparatus for establishing in China Ironworks on the modern systems of operation. Tszechou is the town in or near which these works are to be established, and it is 200 miles south-west of Tientsin, where the Governor-General resides.

How many ages have rolled by since the Chinese were separated from those other families of the human race who spread westwards, and therefore away from them in their emigrations from the highlands of Asia, it may be impossible to determine; but now that we are able to decipher the Chinese literary records, the fact is proven, that about 400 B.C. their celebrated author and philosopher Leih-Tze, was acquainted with

* *Vide* Appendix D, kindly supplied by the Commissioner, Mr. James Henderson.

the native process for making Steel, and, indeed, with the property of tempering it. In the

康 = Kang.

臣 = hi.

字 = tsi.

典 = tien,

or *Kanghi's Dictionary*, published about A.D. 1710, the author, quoting from the writings of Leih-Tze, reports him as saying in regard to Steel, that "a red blade" (by which we take it is meant a *reddish coloured* blade, red being one of the great variety of tints which a clean surface of Steel acquires in the process of being tempered) "will cut jade as it would cut mud." That it is the colour of tempering and not the redness of highly heated Steel to which Leih-Tze alludes, is evident from the manner in which he mentions it in this connexion as capable of cutting jade, a stone of great hardness, upon which it is almost unnecessary to add that red hot Steel could make no impression.

Reflecting, then, for a moment, upon the long continued isolation and stand-still character of the Chinese race, by virtue of which they have not up to this time, like other nations, undergone phases of either retrogression or progression, but have remained unmoved with an almost if not a quite

constant stock of knowledge, tradition, and superstition from the earliest times of their settlement, it is natural to conclude that if we should find in comparatively later times a record of a process for making Steel by them practised, to thereupon infer that the Steel referred to in the book of the Shoo King and in the writings of Leih-Tze, was produced by the same or by a very similar process. Accordingly, in the "Pi-tan" or "Pencil Talk" it is said that Steel is made in the following manner:—
"Wrought Iron is bent or twisted up, unwrought Iron (*i.e.*, which may mean either Cast Iron or Iron ore) is thrown into it. It is covered up with mud and subjected to the action of fire, and afterwards to the hammer."

Making due allowance for the quaintness of the expressions used, and perhaps the difficulty which a mind untrained in the technicalities of Iron and Steel manufacture, must of necessity encounter in conveying to us fully the exact idea of what the account was meant by its writer to express, it is surprising how remarkably near to a well-known process for making Steel the above translation approaches, namely, that of immersing Wrought Iron either into molten Cast Iron, or heating it with Iron ore and fuel, covered over with layers of mud or clay, to exclude as much as possible the oxidising influence of the external atmosphere, thereby deoxidising the Iron ore by contact with excess of carbon, and producing a molten carburet, in which the Wrought Iron eventually becomes immersed as in a bath.

184 *Similarity of Chinese and Greek Processes.*

We have previously pointed out* that Aristotle describes the Greeks to have practised this identical process about 400 B.C. We have then the solid fact of two celebrated authors and philosophers, one in China, the other in Greece, who flourished simultaneously but utterly unknown to each other, describing a similar method of making Steel, practised at the same time in each country,—these countries separated by vast mountain ranges and impassable deserts, into the far East and West from the cradle centre of the human race, which fact, indeed, seems as one of great weight in the chain of evidence now being collected, proving from authentic data the original unity of mankind, in contradistinction to the recently resuscitated Polygenistic Theory. We have also previously pointed out that the Greeks obtained their metallurgical knowledge, like almost every other knowledge they had, from the Egyptians; but it is not easy to mark out the channel by which this old Steel process was conveyed to the Allophyllian races of China from either the Semitic or Aryan nations located near the shores of the Mediterranean; indeed, the only way of accounting for the fact is by returning once again to the old tradition of the original unity of the human race, and allowing to each section of mankind the carrying off with it that common stock of knowledge which the entire family possessed before separation, and of which there is abundant evidence on every side that working in the metals, and Iron in particular, formed a very important element.

The Chinese account of Steel-making at this

* Vide *Proceedings*, Phil. Soc., Glasgow, vol. viii., p. 244, also *ante*, p. 134.

remote epoch is, however, extraordinarily complete in that it describes and names the different kinds of Steel which are produced. The Steel produced by the first treatment, the Iron-workers call Ball-Steel — *twān Kang* (from its rounded form), or Sprinkled Steel, *Kwan Kang* (from the pouring of water). There is what is called "False Steel, *wel*" *tež*, and the account goes on to say, "When I was sent on official business to Tse Chow, and visited the foundries there, I understood this for the first time. Iron has Steel within it, as meal contains vermicelli. Let it be subjected to fire, 100 times or more, it becomes lighter each time. If the firing be continued until the weight does not diminish, it is Pure Steel."

In the Pent Šaow* it is said "there are three kinds of Steel,—

"1st, That which is produced by the adding of Unwrought to Wrought Iron, while the mass is subject to the action of fire.

"2nd. Pure Iron many times subjected to fire produces Steel.

"3rd. Native Steel produced in the south-west at Hai-shan, and which is like in appearance to the stone called *Tsze - shih - ying*, purple stone efflorescence."

It is curious to note here, that there are also three distinct kinds of Steel more especially mentioned by Daimachus as peculiar to Greece, and a fourth which is only referred to by name.†

*A work of the Ming Dynasty, and Dr. Edkins informs us that the Pi-tan, already quoted, is probably also of that period.

† *Ante* p. 137.

“Steel is used for manufacturing swords and knives.”

It is well-known that Steel is still manufactured in China, and we have endeavoured to ascertain the process now used. This is, however, kept secret, and Mr. Henderson, to whom we previously referred as Li-hung-Chang's Commissioner, when lately in this country, explained to us “that the Steel which comes to Tien-tsin from the upper Yangstee is highly prized, and bears much higher prices than the Swedish Steel imported into China.”

That the manufacture of Iron in early times must have reached considerable proportions is clear from another Chinese work coeval with the beginning of the Christian era, the name of which Dr. Edkins has not yet furnished us with. It states that at that time a tax was levied upon Iron to contribute to the State Exchequer. Now it is clear that unless the manufacture had been a somewhat extensive one, it would not have been worth while to levy a tax upon it, for otherwise it could not have produced a revenue.

CHAPTER VIII.

MISCELLANEOUS.

IN the preceding chapters we have seen that each country which has either tradition, or other record of having been a habitation of the human race in pre-historic ages, yields uncontrovertible evidence that Iron or Steel or both were in use by such people at the earliest era we can trace of their existence there. Beyond this we cannot reach with the class of evidence we have dealt with. If, in the ages preceding these, peoples using flints and bones only, and not metal, inhabited Egypt, Babylonia, Assyria, India or China, then they have not left a monumental record, even as they could not, for the simple reason that flints and bones will not cut stones having those qualities of durability which are sufficient to carry down such engraven testimony through thousands of years, and there is no tradition or reliable evidence of any kind whatsoever of earlier peoples using bones and stones only, that we are aware of, attaching to these Oriental habitats.

So sensibly, indeed, does this now seem commencing to be felt, that even Mr. Gladstone, whom in the earlier chapters of this volume we had occasion to point out as yielding to the theory, the universal applicability of which it has fallen to our lot to combat, has at one stroke, in his latest and most erudite work*—issued

* "Homeric Synchronism: an inquiry into the Time and Place of Homer."
By the Right Hon. W. E. Gladstone, M.P. Macmillan & Co. 1876.

from the press, indeed, whilst these our latter pages are in progress—washed his hands of the adhesion he formerly paid to it; for in his opening chapter he remarks: “The important researches of General Cesnola in Cyprus resulted in obtaining a collection of sculptured objects which considerably enlarged the range of pre-historic art, and of implements and utensils exhibiting so extensive an use of uncombined copper, and so clear and wide an application of that metal to cutting purposes, as at once to suggest a modification of the theories of those who, in arranging what may be termed their metallic periods, assume that the age of Bronze invariably came in succession to the age of stone.”*

Further, in his endeavour to point out the extent of agreement between the discoveries of Schliemann at Hissarlik and the statements in the Homeric poems, Mr. Gladstone is most careful to show that such objects as those now admitted to be mentioned in the poems as consisting of “Iron, would be destroyed by corrosion during so many centuries,”† and therefore could not in the nature of things be found in the lowest or oldest Ilian stratum by an investigator of to-day. He thinks because there is no mention in the poems of anything “massive” being made “of this material,” apparently overlooking the heavy piece, either a quoit or bowl of Iron, given by Achilles at the Funeral Games in honour of Patroclus (*Iliad* xxiii.), which, from the manner in which it is there spoken of as capable of supplying the winner’s wants in respect of that metal for no less than five years, cannot have been

* *Op. cit.* p. 1.

† *Op. cit.* p. 46.

a very inconsiderable quantity, that therefore it was extremely "rare and precious."* Such it may have been to the Trojans, even as Iron always has been, and ever must be, to peoples who have to obtain it at a distance from foreign countries, but still the fact remains that although the poems may mention nothing more "massive" than what we have referred to, nor has anything "massive" made of Iron been found by Schliemann, yet tools and implements as massive as anything (with one exception—namely, the Lâht at Delhi) found, or mention made of, in the traditions or most ancient records of other countries, are nevertheless mentioned by Homer, for besides knives, daggers, cutting tools of the chariot-maker, the knife for slaying oxen, &c., Homer informs us that in addition to the mass of Iron which as a trophy he bore off from Eëtion to the ships, Iron "was also used, when raised to a "high temper,† for axes and adzes‡" (Od. ix. 301-3, cf. Il. iii.), which are, in short, precisely the tools found in Assyria, and mentioned in the Cuneiform Inscriptions as we have already seen.§ It is therefore not the slightest disparagement to the testimony against the use of Iron by the Trojans because it is not mentioned in more "massive" forms, nor found "massive."

With this incidental allusion to Mr. Gladstone's work just published, which we could not in fairness omit to notice in a concluding chapter, we turn into another path where we are confronted with certain

* *Op. cit.* p. 46.

† It is perhaps as well to point out that if raised to a high temper, these axes, &c., must have been of Steel, for Iron cannot be "raised to a high temper."—St. J. V. D.

‡ *Op. cit.* p. 46.

§ *Ante* p. 118, *et seq.*

geologists,* by whom the gates are barred, and with whom, by their own confession, on account of the impossibility of ascertaining the rates of geologic activity in the past, and the inability to pronounce what relation in point of time changes in one part of the earth's crust, bear to other changes in other parts, have announced that to the cave deposits, transported river beds, and stratified regions of the Western world, must the last appeal be made; and that appealing to them, we find that they were inhabited by brachykephalic and dolicho-kephalic men, who used nothing but tools of bone and stone in the pre-glacial, inter-glacial, and earliest post-glacial epochs—at a time when the countries, whose testimony we have examined in the preceding chapters, were submerged beneath a vast, high level ocean.

Writes, Godfrey Higgins as if admonished of the assertion which has since been made, the outcome of the tendency which was beginning to appear in his day, among those who accepted the infinitely contorted geological record as reliable proof of an immeasurably higher antiquity for Man than the aggregate of all other evidence of whatever kind indicates: "On looking back into antiquity, the "circle of vision terminates in a thick impenetrable mist. No end can be distinguished. . . . "But in endeavouring to stretch our eye to the "imaginary end of the prospect, to the supposed "termination of the hitherto to us unbounded space,

* We say this advisedly, for geologists are not all of one class; and happily there are those among them, and not a few either, who are prepared to yield much of the extravagant license which has been resorted to.—S. J. V. D.

“ it is unavoidably arrested on its way by a variety
 “ of objects of a very surprising appearance. . . .
 “ When I look around me, on whatever side I cast
 “ my eyes, I see the ruins of a former world—proofs
 “ innumerable of a long extended period of time.
 “ Perhaps among all the philosophers no one has
 “ demonstrated this so clearly as Mons. Cuvier. I
 “ apprehend these assertions are so well known
 “ and established, that it is unnecessary to dwell
 “ upon them. The great age of the world must be
 “ admitted; *but the great age of Man is a different*
 “ *thing. The latter may admit of doubt.*” *

Again, in his “Manual of the Ancient History of the East,” François Lenormant,† with all that refined caution characteristic of his writings, most appropriately remarks: “Unfortunately the researches
 “ of pre-historic archæology *have not yet been pro-*
 “ *secuted in all parts of the globe.* In fact, at present,
 “ only in *Western Europe, and more particularly in*
 “ *France and England.* This is far from the place
 “ where the human race first appeared, or where our
 “ first parents lived. Here the science (*i.e.*, of Pre-
 “ historic Archæology) presents a most lamentable
 “ gap, which no doubt will be one day filled up.”
 “ But, as we shall see, *the facts proved in Europe cannot*
 “ *be regarded as absolutely primordial.*”

Such a conclusion arrived at by one of the most painstaking, conscientious, and diversely investigating of those students of whom Europe at present boasts so many, must be heard with the respect which is unquestionably due to its author; and we

* “Anacalypsis.” By Godfrey Higgins, Esq. † Op. cit., p. 25.

may well listen with profounder satisfaction still, when he, as if standing almost alone in these latter days, has had the courage to further announce, in the teeth of its professors, that "Pre-historic Archæology is presumptuous, and claims, at any rate in the case of some of its adepts, to overturn tradition, to abolish all authority, and to be the only exponent of the problem of our origin. These are bold pretensions which will never be realised. Without aiming so high, the new science, within the limits of the possible, has a part to play sufficiently great and brilliant to satisfy its ambition. To fill up with certainty the enormous gaps in tradition, to give to doubtful statements the authority of facts proved by science,—this is what it will one day accomplish, and has already partly achieved. Pre-historic Archæology, moreover, is as yet but in its infancy, it still leaves great gaps and many problems without solution. There is too often a desire to establish a system, and many scholars hasten to build theories on an insufficient amount of observation. Finally, all the facts of this science are not yet established with certainty,"—and even when they are established for the whole world, it is questionable, indeed, if they will unfold a record so enduring, so certain in its reading, in which each constituent element will be ultimately found located in its proper position, or enclosing as a kernel the central, primal truths which, beyond doubt, are enfolded in the laminæ of tradition and language. Of the latter, the same excellent author (*Op. Cit.*, vol. i., p. 66) remarks: "Ever since

“man began to speak—that is, ever since he began “to exist.” Such is his estimate of language, and therefore the Intellectual character of Primeval Man.

If we confine our enquiries to the West, it most certainly is true—that we have evidence which has been thought by some to prove that man was living here in the interglacial epoch of the tertiary period of geology; some, such as Lyell, say that he was post-glacial, and others again that he was pre-glacial. The evidence we have consists mainly of rude, massive flints,* some of them too having a white coating which is thought by Sir John Lubbock to prove their great antiquity, but it seems more probable that such coating is due to the action of heat, for if a flint be exposed to the action of a hot fire, its surface becomes more or less whitened, probably through some alteration by heat of its atomic structure. It is next to impossible that clean surfaces of flints, such as those of arrowheads, flakes, or celts, could, even allowing them to have been closed up in the deposits where they are found for the millions of years erected by the geologists, have become whitened, unless the strata enclosing them had been subjected to intense heat, and as yet we have not found the strata affording testimony to having been exposed to the action of heat since they were deposited.

Such flints are found in the lowest cave deposits—the *breccias*, for example, in Kent's Cavern, at Torquay, and there side by side with the remains of extinct animals, namely those of the cave-bear, lion, &c. But it is strange that although bones of certain members

* *Vide* Appendix E.

of the brute creation are found in the cave breccias, human *bones* are absent; and it is at best but an inference, based on a weak argument, that man must have been there coevally with the brute, because roughly worked, commonly called "paleolithic," flints are there found.

Do we as yet know the conditions under which the cave breccias * were deposited? and is there not very significant evidence indeed that they were probably formed at quite a late period? For example, the breccia of Kent's Cavern consists, according to Mr. Pengelly, of a dark red, sandy paste, in which are incorporated fragments of dark red grit, all of which are sub-angular and rounded, and of a material which the limestone of the hill in which the cavern is situated could not have supplied. This constitutional character of the breccia proves it to have been washed into the cavern at some period, either by the sea flowing into it and bringing up the grit from a deposit, or an outcrop in its own bed, or to have been carried in by a stream which, at a former period flow-

*. Regarding the mode of formation of breccias, the following from Sir Charles Lyell's "Elements of Geology," Vol. II., p. 516, 10th. ed., 1868, will be found to bear out the argument which we presently advance. "Nothing " is more common in limestone districts than the engulfment of rivers, which " after holding a subterranean course for many miles escape again by some " new outlet. As they are usually charged with fine sediment, and often " with sand and pebbles when they enter, whereas they are comparatively " pure and limpid when they flow out again, they must deposit much matter " in empty spaces in the interior of the earth. In addition to the materials " thus introduced, stalagmite, a carbonate of lime, drops from the roof of " caverns, and in such mixture the bones of animals washed in by rivers are " often entombed. In this manner we may account for these breccias which " we often find in caves, some of which are of high antiquity, while others " are very recent and in daily progress."

ing through the cavern, brought down the grit fragments from probably far distant uplands, either of which actions is sufficient to mix up flint implements of a comparatively late age throughout all depths of such a deposit. In fact, if we analyse the action of either the tidal inflow or the running of a river through a rift such as this cavern, we cannot fail to perceive that the tide or river would either, in short, must, act first upon the surface of the beach, or upon the upper surfaces of the land of the distant heights through which it flows. The direct effect of this would be, if at the period when the deposit of the breccia from either of these causes was commenced, the distant land heights or the beach were occupied, or had been previously occupied, by a race using flints, that these being either lost or otherwise scattered about or near its surface, would be deposited to a certainty on the lowest or first formed strata of transported material—viz., that composing the very bottom of the cave breccias, whilst those transported afterwards from the deeper portions of the soil would be deposited at a higher level therein. In short, the order of deposits in the breccias would be precisely the inverse of what existed in the locality from which the material had been transported. And although we do not as yet know much with accuracy as to the depth of some breccias, the bottom of that in Kent's Cavern not having been reached, yet it cannot be denied that we have abundance of evidence to show in how short a time a rift or cave may have its bottom charged with water-rolled rock fragments, both by the wave-transporting action of successive tides as well as

by the tearing down and rolling action of a river or stream—so that if we follow out such considerations, we finally perceive that it is not in the least impossible that the flint implements of the breccias really belong to a race living in the West, quite within what is now unquestionably the historic period in the East. But at this point we are brought in contact with those who have hazarded the building up of the so-called science of anthropology upon the incomplete data to which M. Lenormant has so well directed our attention—to whom this almost certain inversion of littoral or fluviatile strata in caves and transported river beds from the natural order of their deposit seems not to have occurred—and who assert in the teeth of what has been ascertained as to the present growth or rates of deposit of certain strata, that these breccias must of necessity be, by immense cycles of milleniums, pre-historic, by virtue even of the several other deposits over them of stalagmites and cave earths. What is true here as to the inversion of the strata in a cave breccia is true also for transported river beds, or loess, wherein have been found first the so-called “neolithic” flints, and *below* these, strata enclosing the “palæolithic” flints, which, on a preliminary view, appears to indicate the presence of races undergoing progressive development, but when seriously viewed in the light of that inversion we have above referred to, is found to correspond to the existence of a race undergoing degradation.*

Let us then look into the crystalline stalagmite immediately above the breccias—not a sign is there

* *Vide* Appendix F.

of human relics in that deposit, nothing, according to Mr. Pengelly, but bones of bears,* not even a trace of the cave hyæna. How is it then that neither man's bones nor his works appear here? Did he suddenly cease to be a cave-dweller?—or did the bear as suddenly become reconciled to man and no longer drag him into the dark recess of the rock, there to mutilate his body and gnaw his bones. This sudden disappearance of man or alleged works of his in the crystalline stalagmite stratum ought not to have occurred if the theory which is advanced about him be true: his absence cuts the lines on which the theory rests. And the only conclusion we can arrive at is, that man did not live coevally with the bear in those regions near the caves over which he roamed, although it is clear that if the flints of the deeper-down breccias are man's work, he must have lived in other and far distant regions before that stalagmite was deposited. The cave bear indeed seems to have reigned supreme in the locality during this period of stalagmite deposit, but upon what he fed we know not. In this stalagmite—which is a natural production of the cave itself, arising from the percolation of water charged with carbonic acid, and dissolving the limestone, so that the carbonate formed drips from the roof over the lower floor of breccia, and seals up whatever may be lying thereon, or perchance may be scattered upon it during the formation of the stalagmite—this inversion of order due to the manner in which the breccias are formed cannot possibly occur. Now so far as we can follow the cave strata, and happily they have been closely inspected, there undoubtedly

* “Kent's Cavern,” p. 19, 1876.

appears to have been some grand physical cause which produced a sudden check to the breccia deposit, which stopped the influx of the river or sea, and permitted water to percolate the limestone rock by which the overlying stalagmite is formed; for there is so distinct a division without gradation from one stratum to another in the cave deposits, which can only be accounted for by the assumption of a sudden upheaval preventing, on the one hand, the influx of the sea waters, or on the other hand, directing the course of the river from flowing through the cave or rift; or a sudden change of climate which froze the rivers at their mountain sources, so that they could no longer run, the slow melting of the lowland ice affording but water enough to disintegrate the limestone for the stalagmite formation. It is not essential to suppose that water did not percolate the limestone roof of the cave before such violent change occurred, for the liquid drip from the roof into the inflowing or outflowing sea or river water would be thereby so diluted and thrown about by the water's motion as to prevent the formation of stalagmite; but immediately that either of the changes to which we have alluded took place, then the drip from the roof reaching and resting on the solid floor would form stalagmite, cementing, over the breccia from a mere film to a foot or more in thickness, and this, when considered alone in terms of the slow rate which geologists have assumed for the formation of a stalagmite deposit, might indeed require milleniums for its production. But, as against this interminable assumption, it is somewhat significant that observers

have been enabled to ascertain something definite as to the rate of growth of stalagmite, the facts deduced from observations upon which render it extremely probable that all the cave deposits have been formed quite within the more moderate period which other testimony has assigned for the past duration of man on the earth, and in support of this we quote the following from Mr. Boyd Dawkins' recent work.*

“The only attempt to measure with accuracy the rate of the accumulation of stalagmite in caverns, in this country, is that made by Mr. James Farrer in the Ingleborough Cave, in the years 1839 and 1845, and published by Prof. Phillips in the ‘Rivers, Mountains, and Sea Coast of Yorkshire’” (second edition, 1855, pp. 34-35). “The stalagmite of which the measurements were taken is that termed, from its shape, the Jockey Cap. It rises from a crystalline pavement to a height of about two and a half feet, and is the result of a deposit of carbonate of lime, brought down by a line of drops that fall into a basin at its top, and flow over the general surface. On March 13th, 1873, in company with Mr. John Birkbeck and Mr. Walker, I was enabled by the kindness of Mr. Farrer to take a set of measurements, to be recorded for use in after years.

“For the sake of insuring accuracy in future observations, three holes were bored at the base of the stalagmite, and three gauges of brass wire, gilt, inserted; gauge No. 1 in the following table being that on the S.S.E., No. 2 on N.N.E., No. 3 on the West side. The curvilinear dimensions were taken with fine iron wire, or with a steel measure; and

* “Cave Hunting.” London, 1874, pp. 442 4.

“ the circumferential around the base along a line
 “ marked by the three gauges. The measurements 2,
 “ 3, and 4 of the table were taken on the 15th of
 “ March, by Mr. Walker, and their accuracy may be
 “ tested by the fact that they coincide exactly with
 “ No. 1, which I took two days before.

“ The lengths of wire, properly labelled, are deposited
 “ in the Manchester Museum, the Owens College, for
 “ future observers.

“ In the following table I have given my own
 “ measurements and compared them with those taken
 “ by Mr. Farrer :—

TABLE OF MEASUREMENTS.

	13th Mar. 1873. Inches.	1839. Inches.	30. Oct. 1845. Inches.	Increase since 1839. 1845.		Rate of Increase per annum. Inches.
1 Basal circumference at Gauges.....	128	118	120	10	8	·2941—·2857
2 Gauge No. 1 to Gauge No. 2.....	52·625					
3 Gauge No. 2 to Gauge No. 3.....	35·0					
4 Gauge No. 3 to Gauge No. 1.....	40·375					
5 Gauge No. 1 to hole in centre of basin at apex	30					
6 Gauge No. 2 to hole in centre of basin at apex	29·5					
7 Gauge No. 3 to hole in centre of basin at apex	31·4					
8 Height from Gauge No 1	20·9					
9 Height from Gauge No. 2 min.....	20·4					
10 Maximum.....	29·7					
11 Tape measurement on slope Gauge No. 1 to edge of apex.....	26·7					
12 Tape measurement on slope Gauge No. 1 to edge of apex.....	26·6	21·0		5·6		
13 Tape measurement on slope Gauge No. 2 maximum to edge of apex.....	36·0	32·0	35·0	4·0	1·0	
14 Roof to apex of Jockey Cap.....	87		95·25		8·25	·2946
15 Roof to tip of stalactite.			10			
16 Stalactite to apex of Jockey Cap.....			85·25			

“ Unfortunately I have been unable to identify the
“ exact spots where the stalagmite was measured by
“ Mr. Farrer, so that the only measurement which
“ affords any trustworthy data for estimating the rate
“ of increase is number 14. With regard to this, the
“ only possible ground of error is the erosion of the
“ general surface of the solid limestone, of which
“ the roof is composed, by carbonic acid, since the
“ year 1845, and this is so small as to be practically
“ inappreciable. We have, therefore, evidence that
“ the Jockey's Cap is growing at the rate of .2946 of
“ an inch per annum, and that if the present rate of
“ growth be continued it will finally arrive at the roof
“ in about 295 years. But even this comparatively
“ short lapse of time will probably be diminished by
“ the growth of a pendent stalactite above, that is now
“ being formed in place of that which measured ten
“ inches in 1845, and has since been accidentally
“ destroyed. It is very possible that the Jockey Cap
“ may be the result not of the continuous but of the
“ intermittent drip of water containing a variable
“ quantity of carbonate of lime, and that therefore,
“ the present rate of growth is not a measure of its
“ past or future condition. Its possible age in 1845
“ was estimated by Prof. Phillips at 259 years, on the
“ supposition that the grain of carbonate of lime in
“ each pint was deposited. If, however, it grew at its
“ present rate it may be not more than 100 years old.
“ All the stalagmites and stalactites in the Ingle-
“ borough Cave may not date further back than the
“ time of Edward III. if the Jockey Cap be taken as
“ a measure of the rate of deposition.” To this Mr.

Boyd Dawkins adds:—"It is evident, from this instance of rapid accumulation, that the value of a layer of stalagmite, in measuring the antiquity of deposits below it, is comparatively little. The layers, for instance, in Kent's Hole, which are generally believed to have demanded a considerable lapse of time, may possibly have been formed at the rate of a quarter of an inch per annum; and the human bones which lie buried under the stalagmite, in the cave of Bruniquel, are not for that reason to be taken of vast antiquity. It may be fairly concluded that the thickness of layers of stalagmite cannot be used as an argument in support of the remote age of the strata below. At the rate of a quarter of an inch per annum, twenty feet of stalagmite might be formed in 1000 years."

According to a recent statement by Mr. Pengelly, the upper or granular stalagmite floor (for there are two such floors) in Kent's Cavern varies "from a mere film to five feet in thickness,"* and the maximum part, according to the observations just cited, as made in the Ingleborough Cave, taking but a quarter of an inch only per annum, or much less than what was found to be the rate of deposit in the Ingleborough Cave, to be the rate of growth of the stalagmite in Kent's Cavern, would be built up in about 240 years, assuming the rate of deposit to have always been what that in Ingleborough Cave now is. But there is every reason to believe that in the past the processes or operations of geological agency which have

* "Kent's Cavern: Its Testimony to the Antiquity of Man." London and Glasgow: Collins. 1876. p. 15.

wrought such changes in the structure of the earth's crust have gone on at an immeasurably more rapid rate, which probability has also been well expressed by Mr. Boyd Dawkins thus—"Any attempt to ascertain the absolute date of pre-historic events must of necessity fail, since it is based on the improbable assumption that the physical agents have acted uniformly, and that therefore the results may be used as a natural chronometer. The present rate of the accumulation of *débris*, as at the Victoria Cave, or of that of silt in the deltas of rivers, such as the Nile, or the Tinière, may convey a rough idea of the high antiquity of pre-historic deposits; but a slight change either of the climate, or of the rainfall, would invalidate the conclusion. When the greater part of Europe lay buried under forest, when Palestine supported a large population, and when glaciers crowned some of the higher mountains of Africa, such as the Atlas, the European and Egyptian climates were probably moister than at the present time, and the rainfall and the floods greater, and consequently the accumulation of sediment quicker than the observed rate under the present conditions.* And in the same way all estimates of the lapse of past time, based upon the excavation of a river valley, or the retrocession of a waterfall, such as Niagara, lie open to the same kind of objec-

* As an instance of the rapidity with which deposits accumulate in the bed at a river's mouth, we may appropriately cite the following cutting from a newspaper of date June 15, 1876:—

"CAPTAIN STANLEY'S SURVEY OF THE TAY.—Captain Stanley, who was appointed to make a survey of the mouth of the Tay in consequence of complaints that the lighthouses were misleading, has been busy for several

tion. It is not at all reasonable to suppose that the complex conditions which regulate the present rate of erosion, have been the same during the time the work has been done, and it therefore follows that the work done is a measure of the power employed, *and not of the length of time during which it has been in operation.*" It is not, therefore, unreasonable to infer that a much shorter period was occupied in the formation of the cave deposits; and the fallacy of the existing methods of estimating geological time has lately been exposed by Mr. Croll,* who remarks:—"Various attempts have been made to measure the positive length of geological periods. Some geologists have sought to determine roughly the age of the stratified rocks by calculation based upon their probable thickness, and the rate at which they may have been deposited. This method, however, is worthless, because the rates which have been adopted are purely arbitrary. One geologist will take the rate of deposit at a foot in a hundred years, while another will assume it to be a foot in a thousand, or perhaps ten thousand years; and for any reasons that have been assigned, the one rate is quite as likely to be correct as the other; for if we examine what is taking place in the ocean bed at the present day, we shall find in some places a foot of sediment laid down in a year, while in other

days past taking soundings at the entrance to the river. The captain is engaged drawing a new chart of the estuary. Since the last survey was made, somewhere about ten years ago, the sandbanks have shifted very considerably, the water being in some places 16 or 17 feet less than the depth marked on the existing charts, and the buoys at least will have to be shifted from their present positions."

* "Climate and Time," p. 360.

“ places a foot may not be deposited in a thousand
“ years. The stratified rocks were evidently formed
“ at all possible rates.” But in Kent’s Cavern there
is found what has been thought by some as tolerably
conclusive evidence that there at least the growth of
stalagmite is so exceedingly slow that some thousands
of years must have been necessary to produce one inch
of it. There have been found in that cavern, Mr.
Pengelly tells us, “masses of stalagmite, having in-
“ scriptions on them, consisting of names, initials,
“ and dates, and the earliest of them is dated 1604.
“ Besides this there are 1615, and several others in
“ the early part of the seventeenth century. We
“ have reason for believing that these inscriptions are
“ perfectly genuine” (Op. cit., p. 4). To this Mr.
Pengelly adds the following reasoning—“ Then that
“ granular stalagmite was formed slowly. There are
“ inscriptions on it probably not more than one-eighth
“ of an inch deep when they were cut. The 250 years
“ that have elapsed since then have produced a mere
“ film, which has not only failed to obliterate them,
“ but is not more than one-twentieth of an inch thick.
“ That, were we sure that the rate of accretion had
“ been uniform, would give 5000 years for an inch of
“ stalagmite” (Op. cit., p. 31). Elsewhere we are told
by the same high authority that “ wherever the drip in
“ wet weather is very copious, there the stalagmite is
“ of great thickness; wherever there is very little drip,
“ the stalagmite is thin” (Op. cit., p. 15). Before
then we can assume the thin film over the inscriptions
as a test of the rate of even the recent growth of the
Kent’s Cavern stalagmite, we must be satisfied on Mr.

Pengelly's own showing whether these inscriptions are situated in places where, since their production, there has been either a copious drip, a little drip, or no drip at all.

Over as well as below the stalagmites, deposits of "cave earths" occur, each of which, by virtue of its totally different character to that of the stalagmite, proves the occurrence of some other violent change by whose agency water was most probably again admitted, so as to flow into or out of the caves, and which bringing mineral and vegetable matter from unknown distances, and mingling it with the bones of man and beast, as well as those relics of man's workmanship which the running stream or inflowing tide would pick up and carry on in its course, buried them promiscuously in the "cave earths." When anyone may see for himself, as he can at any time by observing the action of a stream running through a rift in the rock, or the tide flowing into a gorge, with what rapidity fine, sandy, or earthy matter and vegetable detritus are deposited, and the thicknesses of the deposit constantly varied at points by alterations in the rate or duration of the flow, caused by the falling in of obstructions, such as trees or stones, it may easily be seen that a very few years of such action by water would suffice to produce either the lower layer of cave earth or the upper layer of black mould; so that with rivers flooded by the tropical rains which once prevailed over our land, or by the melting of the glaciers of the Great Ice Age, it would indeed be more surprising than otherwise were we to find that the fury of the floods thus produced had not

brought down the carcasses of man and brute and buried them in the deposits then made where we now find them.

It is no manner of proof whatever, then, that man has lived in such vastly long past ages because the bones of his own body and his bone and flint tools are associated with the large and tropical mammalia which he has survived; it is, in fact, no manner of proof whatever that these extinct mammalia ever lived in such immensely long distant ages, which in support of a certain theory it has been found convenient to assume. Indeed we must not forget "the fresh condition" in which some of the extinct mammalia have, in our own day, been found in the ice-gravels of Siberia. The cave deposits prove nothing of the kind, and what may be thus said of them, may with equal truth be said of the fluviatile and marine deposits, the deltas and shores—for as we know nothing, absolutely nothing, of geological change rate, whether it has been isochronous or not, we can know nothing of the time. This, however, we do know, that even under the present observed rates of geological change, the running or tidal action of water, climatic variations, and volcanic action are sufficient to produce, within a few thousands of years, the several sets of facts we find in the caves and transported beds of the rivers and ocean, wherein evidence has been met with, which has been considered to prove the presence of man at the spot when they were laid down; and although this may appear to be only our assertion, yet a strict comparison of caves, with the known facts of geological changes, will generally be found to

account satisfactorily, for circumstances which, in view of what has come to be taught, certainly seem to be very surprising. To take an extreme case—namely, that of the anterior and basic portions of a human skull, found by Mr. James Matson at Altaville, in California, in 1867, at a depth of 130 feet from the surface, embedded in five feet of gravel, above which lay four beds of volcanic tuff, alternating with deposits of gravel, one of which was 25 feet thick, and for the publication of which occurrence the world is indebted to Professor J. D. Whitney*—the difficulties in the way of accounting for this position of remains alleged to be human, except upon the assumption of man existing at an immensely remote age, in reality disappear. Two facts are sufficient to be cited. *First*, a Roman pavement, consisting of hewn stones, cut, according to Mr. James Thomson, F.G.S., with iron tools, recently discovered in the Clyde, at Glasgow, under some twenty feet or more of sandy deposit, stratified with leaves of trees; and, *secondly*, the well-known rapidity with which volcanic eruptions, even in the course of a few hours, will form a thick deposit. Herculaneum and Pompeii have been buried under from 70 to 112 feet of volcanic deposit since A.D. 79.

And now, signs that some of the promoters of the High Antiquity Theory feel the basis of the structure which has been raised to be quaking are apparent, for it has been conceded by some amongst them that this Western world, wherein the testimony has alone been adduced, upon which endless ages have, as Cuvier once

* "Anthropological Review," Jan., 1868, p. 119. "Trans. Chicago Acad. Scien.," vol. i., p. 2.

put it, been "called into existence by the dash of a "pen," is probably very "far from the cradle of the "human race."* Since such admission has been so recently made, to what limbo of inutilities, to what "paradise of folly," may we not then consign the theoretic structure erected upon a foundation which now would appear to rest not on a bottom. If not then found in the West, it must be to the East that we have to appeal, according to the theorists themselves, as well as according to all tradition, and as resulting from the evidence of language too, for the earliest testimony concerning man and the manner of creature he was, whether at the first possessed of high intellect and practical skill, or whether a low, grovelling, and more than beast-like being, as he has been asserted. There is no middle course; in the East or West the testimony must be found, and therefore, as directed, to the East we now propose to address ourselves, for it has been said, "There is good reason for the belief, that at the "time the Egyptian and Assyrian Empires were in the "height of their glory, Northern Europe was inhabited by rude, polished-stone-using races,"† and M. Lenormant adds‡ — "All appearances seem to "indicate that when in Europe the Dolmens of the "Age of Stone were first constructed, the people of "Asia had for centuries been in possession of Bronze, "Iron, and all the secrets of a very advanced material "civilisation."

As to the age when man first reached the West from his orient cradle-land—from which *locale* he is generally

* "Kent's Cavern," p. 32. † "Cave Hunting," by Boyd Dawkins, p. 139.

‡ "Ancient History of the East," p. 36.

allowed to have come—that is not to the point in this inquiry; and if he really did arrive here a brutal savage, that is not material either—for neither constitute the least proof of what he was at the beginning in his Eastern home. “Let us look fairly (says David Page)* at “the facts: the river-drifts, cave-earths, and lake-silts “are, no doubt, very ancient, but there is nothing connected therewith that may not (computing by existing operations) have been accomplished in ten or “twelve thousand years. Again, the mammoth, “woolly rhinoceros, cave-lion, cave-bear, and cave-hyæna, are but species of living genera; and so little “do they vary in general character from those still “living, that their appearance at the present day “would excite no marvel.” Surely these are admissions which it is well to carefully note, for if from untold millions of years the Geologist is now content to satisfy the requirements of the facts he has met with in his research, by ten or twelve thousand years of time, it is an almost infinitely smaller leap, and a much more reasonable one, if the need for it should arise, to divide that quantity by 2, which brings us at once quite within and almost exactly in consonance with what Revelation,† so far as its chronology has yet been made out, declares for the period of the occupancy of the Earth by Man. But then, while we are far from wishing it to be supposed that we have as yet unequivocal evidence that the earlier books of Revelation were intended of themselves alone (that is unaided

* “Geology for General Readers,” p. 284.

† *Vide* “The True Age of the World.” Professor Wallace, London. 1844. Also “Facts and Dates.” Rev. Alexander Mackay, LL.D. 1869.

from other sources) to convey a testimony of exact chronology, the vast differences in the numbers employed in the three different versions tending to discredit this view, and indeed lean rather to the belief of Silvester de Sacy, who viewed Biblical chronology *per se* as non-existent, and M. l'Abbé Le Hir, who says, "Biblical chronology is uncertain; it is left to human science to ascertain from other sources the date of the creation of our species." Yet it seems almost impossible to suppose, that that great First Cause by which "the Heavens and Earth were created," knowing the past and foreseeing all future, could permit this serious question of Man's chronology to assume the importance it now occupies in the minds of the foremost, without planting somewhere within the reach and observation of that intelligent being testimony of a sure and certain kind, which in the earnest pursuit of truth should erewhile be read. Says M. Lenormant again, *Op. cit.*, p. 40:—"The calculations which have been attempted on Biblical chronology rest in fact solely on the genealogy of the Patriarchs from Adam to Abraham, and on the statements as to the duration of their lives. But first the primary element in a real and scientific chronology is absolutely wanting. We have no means of determining the measure of time by which the length of each Patriarch's life is computed, and nothing in the world is more vague than the word 'year,' when it has no precise explanation. Moreover, between the different versions of the Bible, between the text of the Hebrew and Septuagint (whose authority in chronology is equal), there are, in the generations from Noah to Abraham,

“ and in the years of life, differences so great that interpreters may arrive at calculations which differ by more than 2000 years, according to the version which they select as their guide. In the text, as it has come down to us, the numbers are anything but certain; they have been subjected to alterations which have rendered them discordant; alterations the extent of which we cannot estimate; alterations which, however, need not trouble the mind of any Christian, for the more or less exact transcription of a number must not be confounded with the question of the Divine inspiration, which has given Holy Scripture to teach man his origin, his way, his duty, and his end. Moreover, besides the want of certainty as to the original reading of the numbers given in the Bible for the existence of each of the Patriarchs from Noah to Abraham, the genealogy of these Patriarchs can be considered by a good critic (if used alone) only as having the same character as the genealogies habitually preserved among Semitic people—among the Arabs for instance—which establish direct affiliation by the enumeration of the most remarkable personages, omitting many intermediate steps.

“ These decisive arguments prove that *there is no real Biblical chronology, and therefore no contradiction between that chronology and the discoveries of science.* However distant may be the date to which researches on fossil man one day carry back the existence of the human race, the narrative of the sacred books will be neither shaken nor contradicted, for it assigns no positive date, either for the creation of man or for the

“deluge.” All that the Bible expressly says is, that
“man was the last creature whom God placed on
“the earth, and this the discoveries of science, far
“from denying, confirm in the clearest manner.

“But while we admit that religion need not limit
“the freedom of scientific speculations as to the anti-
“quity of man, we are bound to state that science can
“as yet assign no date to, however far it may carry
“back, this antiquity. We have no standard by
“which to determine, even approximately, the num-
“ber of ages which have elapsed since the time of the
“*first men whose remains* have been found in the
“*quaternary* deposits. We are in fact treating of
“geological formations, whose rate of deposit may be
“accelerated or retarded by widely different causes
“which we have no means of estimating. Nothing,
“even in the present day, is so variable as the rate of
“deposit of fluvial alluvium, like that of the qua-
“ternary epoch. And moreover, the occurrences of
“that period cannot be compared with those of the
“present time, as causes were then in operation on a
“scale which no longer exists. So that the hundreds
“of thousands of years, which some authors with too
“lively imaginations have reckoned, from the first
“traces of fossil man to our own times, are really
“baseless hypotheses, and mere guesses. The date
“of the appearance of the human species, according
“to the geological record, is still unknown, and will
“probably remain so for ever.”

If what we have been taught to accept as such, really
be the Revealed Word, and the Revelation of Nature are
at variance absolutely and beyond further question, we

may refuse then to trust either—rather discard both, and consign ourselves to the dogma of the Atheist, who, with plummet long, the depths has sounded and declared, No God! from which there is, in short, no avenue of escape, lest it be that our priests and our men of science are each content to admit that thus far we are only on the road of comprehending both. For if of the geological record those who have most earnestly investigated it, have the candour to affirm that “it is assuredly “indefinite and defective—indefinite as it deals only “with relative time; and defective as many strata “cannot be assigned to their proper positions, partly “from the obscurities of superposition and partly “from the absence of typical fossils to connect them,” thus rendering the record most difficult of interpretation, so would it appear much more reasonable for the priesthood to point out the great difficulties in the Record which they profess to expound, and popularise the internal significance of, rather than to gloss easily over these and profess with the arrogance which appears too off assumed—namely, the power in their order alone, to unveil the depth of things which it hath not entered into the heart of man to conceive therein enshrined.

If seriously dwelt upon, it can hardly admit of a doubt that the extreme unwisdom of the priesthood during the past, in dogmatising against the facts brought to light by geological and archaic research, unacquainted as that body of men, with but rare exceptions, confessedly has been with the real nature of the geological and archaic records, is the source of that warfare which exists; the seed of that extravagant growth appearing on both sides. The priest-

hood has not been content to meet the Geologist and Archæologist on a common platform, and collate the facts or points upon which the testimonies agree, and in the bond of true fellowship to proclaim, "Thus far do the records co-ordinate!" The evidence we have had during the present century of the incomplete comprehending of some contents of the books of Revelation, has been but too lamentably exemplified in the case of those who have assumed the power to interpret prophecy and to pronounce the values of Biblical numbers; the time for the coming to pass of events which the modern prophet forewarns as about to happen on the earth having gone by without the events occurring.

We have had occasion, then, to touch the record of Revelation, and if those who follow us thus far permit its introduction at all, it is unnecessary in support of the argument we have advanced, to do more than remind them that this proclaims the use of Iron and Copper at the very beginning of man's existence, and this statement has its counterpart in the religio-traditional legends of other nations, in which, as we more closely analyse them, it is more plainly seen that the near agreement between the Traditions and Sacred Writings of other nations and much of the books of Revelation amounts almost to proof of their embracing the same permanent truths, under forms and symbols which, at a later age, characterised the usage of the non-Semitic Races in conveying the instruction committed to their charge. To Tubal Cain of the Semites corresponds Twachtre of the Vedas, Hephaistos of the Greeks, Vulcan of the Romans, &c.

Whilst, then, it is plain from what we have passed

through that the true reading of much of the Geological record is thus far impossible, and therefore it cannot on the very account of that uncertainty be rationally concluded to contradict Revelation, it is well to bear in mind that in cases where the stratifications of the earth are due to the direct overgrowing on one another of strictly human relics, as in the case of Dr. Schliemann's discoveries at Troy, they are in consonance with tradition. Further, Dr Schliemann's discoveries at Mycenæ strikingly bear out what we advanced on a former page, as against the theory with which we have been dealing. The subjoined * extracts from the *Times* of November, 1876, shows that the highest excellence in metal working, and what has been styled the lowest step in the use of material or that of "flints," may

* "DR. SCHLIEMANN AT MYCENÆ.—A telegram from Argos says that in "the great circle of parallel slabs beneath the archaic sepulchral stones "considered by Pausanias, following tradition, as the tombs of Atreus, "Agamemnon, Cassandra, Eurymedon, and their companions, Dr. Schlie- "mann has discovered immense tombs containing jewellery. He found in "one portion of the tomb human bones (male and female), plate, jewellery "of pure archaic gold, weighing five kilogrammes, two sceptres with heads "of crystal, and chased objects in silver and bronze. It is impossible to "describe the rich variety of the treasure."

"FURTHER DISCOVERIES AT MYCENÆ.—Dr. Schliemann has found in the "same tomb already referred to another great quantity of women's jewellery "in gold, and handsomely worked. Immediately after commencing excava- "tions at an adjoining tomb a large head of a cow in silver, with immense "horns of pure gold, was found. A large girdle of gold, five gold vases, and "immense golden buttons were also found. All these objects were mar- "vellously worked. Among other discoveries are nine smaller vases and "numerous swords of bronze, but no trace of iron-work."

"MYCENÆ.—Dr. Schliemann, continuing his researches in the tombs at "Mycenæ, found on Tuesday the following articles of pure gold splendidly "ornamented:—A helmet, two diadems, a woman's large comb, a large "breastplate, three masks, six vases, two bracelets, two rings, three brooches, "an immense mass of buttons, leaves, and other articles, three large girdles, "a silver vase, a stag cast in lead; with a mass of swords, daggers, axes, and "warriors' knives, all of bronze, with 25 flint-headed arrows."

exist side by side coevally. The fact of no Iron being found at Mycenæ is natural, and just what should prove to be the case, for unless in pieces of very large dimensions, immensely larger indeed than the relics of gold, silver, &c., which have been found, it could not possibly have escaped complete oxidation. It only quite the other day was published in *Nature* (Sept. 30, 1875*),

* "Through the kindness of Horace Fisk, of Trenton, and Major Jed. Hotchkiss, of Staunton, Va., I have been able to procure two specimens of hæmatite iron ore† hatchets, of aboriginal manufacture. They possess great interest from the fact of being very similar to native copper axes, characteristic of the 'finds' of relics of 'mound builders.' The specimens, one of which is here figured, have unquestionably been hammered out cold, and shaped from a fragment of the ore, without the aid of fire in previously refining the mass. The specimen figured measures five inches and a quarter in length, by three inches in breadth at the cutting end. The opposite end is square, nearly two inches in width, and somewhat thinner than the broader portion of the implement, which is nowhere of greater thickness than one-fourth of an inch.

"The entire surface still shows the hammer marks made in shaping the hatchet, even to the edge, which now shows no trace of grinding or polish, —but this may have been obliterated by the rust;—but I am inclined to believe, from close inspection of both specimens, that the edge originally was a hammered one and not a ground one, making the specimen more nearly allied to the 'clipped' jasper hatchets than polished (ground) porphyry axes.

"Another specimen is four and a-half inches in length by two in breadth, is nearly uniform in thickness about three-sixteenths of an inch, a well-defined edge, which, from its slightly wavy outline and slight variation in width, I believe to be a hammered, and not a ground or polished edge.

"Two other specimens, similar to these, were found with them, and are now in the calimat of Major Hotchkiss, who informs me that the series of four were found under an uprooted tree, on an Indian trail, at the Forks of Kelley's and Rich Creek, Gauley Mt., Tayette Co., West Va.

"It has been suggested that the use of hæmatite for paint among our Indians may have led to its employment for other purposes ('Flint Chips,'

† It is proper to remark that it must necessarily be erroneous to conclude these hatchets as being of "hæmatite iron ore," for such ore is extremely brittle and absolutely unforgeable, and would not show hammer blows such as are represented in the woodcut, and described in the account. The hatchets could only be of metallic Iron.—*ST. J. V. D.*

that apparently metallic Iron axes of an age supposed to be earlier than the stone axes of the Aboriginal Indians, had been found in America.

Most persons — excepting the comparatively few who have accepted the polygenistic theory of man — bow down to the teaching of universal tradition, that to the neighbourhood of the Caucasus must we apply for testimony as to what man was at the

“ by E. T. Stevens, p. 553), and this is no doubt true, inasmuch as small



“ irregular fragments of this mineral
“ were often utilised, if the shape
“ would at all permit, as arrow-heads.
“ Among the thousands of arrow-heads
“ gathered at New Jersey, I have not
“ met with one of Iron ore that has
“ been worked into any of the various
“ patterns of flint points; but from
“ graves, associated with others, I have
“ found fragments of the ore, and once
“ of native copper, of such shape and
“ size, and so placed, that they were
“ evidently arrow-heads.

“ A curious form of ‘relic,’ known
“ here as a ‘plummet,’ occasionally
“ occurs, made of Iron ore. One such
“ is figured in the *American Naturalist*,
“ vol. vi., p. 643, Fig. 132. This speci-
“ men ‘is made of Iron ore, ground
“ down and until it is almost as smooth
“ as glass.’ As such plummets are found
“ in the western mounds, as well as on

“ the surface of the ground throughout the Atlantic coast States, and are
“ always polished, it seems fair to presume that a cutting instrument of
“ such hard material would undoubtedly be polished and ground, if, at the
“ time of its manufacture, grinding was known or practised among the
“ aborigines in fashioning their various weapons and instruments.

“ When we consider that these Iron hatchets were found in a locality
“ once thickly populated by Indians, and probably frequently visited, if not
“ occupied, by the mound-builders, and now yield, on search, an abun-
“ dance of ordinary stone implements of every grade of workmanship and
“ variety of pattern, it seems at least probable that the specimens in question

beginning. But it is stated by some geologists that all the vast Orient territory had not emerged from under the sea at the time when the bones and implements of the primitive brachy-cephalous Britons were buried under the glacial drift—that “there is a strong probability of the existence of “paleolithic savages on some of the warmer regions “of the earth at the time when the very site upon “which the Pyramids are built was a broad estuary “covered by the salt water of the Mediterranean; “when the deserts of Gobi and Shamo, the plains of “Yarkand, Tarim, &c., were covered by the waves of “a vast high level Mediterranean, and a large portion “of the plains of Hindostan, China, and Mesopotamia “were yet in process of deposition from the turbid “estuaries of the Ganges, Indus, Hoang Ho, Tigris, “and Euphrates.”* Supposition such as that contained in the preceding passage is one thing; and certainty, which alone is science, is another thing. And such a supposition constitutes one of the “pre-“sumptions” which M. Lenormant so justly exposes;

“were not fashioned at a time when the polishing and grinding of weapons
“was customary, but earlier, as the labour of beating so hard a material
“into its present shape would doubtless be supplemented by polishing, if
“the additional value given to an implement by the operation had been
“recognised.

“As the writer has already endeavoured to show, through an extensive
“series of New Jersey specimens (*Nature*, vol. xi., p. 215), that the ruder
“chipped implements of ‘our native rocks’ are older than the more elaborate
“jasper and porphyry specimens, so I consider these hammered Iron hatchets
“to be of an earlier age than either the polished Iron plummets of the mound-
“builders, or ground axes of the Indians.

“CHARLES C. ABBOTT.

“Trenton, New Jersey, U.S.A.”

* W. Mattieu Williams, in “Iron,” Dec. 18, 1875, p. 776.

for because there is evidence of all that Eastern territory being geologically a recently upraised sea bottom, it does not follow from that, that it was not inhabited long before the West. It is simply impossible in geology to fix a horizon common to all the world at the same time.

As we have seen that the further researches are pushed, so much the more unlikely do their results lead us to hope that man ever will, by absolute, tangible, material evidence, solve the question of the true age of geological periods; so it is still less probable that he will, from such sources alone, evolve the true *locale* of his progenitor. If so, then, are we not compelled to fall back on the other records—tradition and language—as the very best evidence we possess to deal with in this question?

In the preceding chapters we have found that, as far as it is possible to reach in all Oriental countries, there is abundant testimony as to the use of Iron in the whole of them—that is to say, in the very earliest periods we can find out anything certain about. If we go to the foot of the Caucasus, there we meet with a race called by the Greeks the “Chalybes,” from whom the Assyrians obtained their Steel, and who assert (it is believed of their own tradition), that they have produced Steel there from “the most primitive ages” (Lenormant). Herodotus, too, tells us that the Massagetæ, who were barbarous in a high degree, were in possession of metallic implements; and among the Ugrian tribes, the working of mines certainly commenced in a social state, but very little advanced. In the Oural and Altai mountains, traces

have been found of excavations more than 100 feet deep. "Some negro people, too," M. Lenormant further remarks, "know how to work metals, and even to manufacture steel, and that without being really civilised. Nevertheless, it is incon-
 "testible that the art of working metals has been one
 "of the most powerful agents of progress, *and it is*
 "*precisely among people whose civilisation is oldest that*
 "*we find this Invention known at the earliest date.*"*
 It is, to say the least, not a little curious, as we learn from Sjögren (*Ossethic Grammar*, p. 396), that in the valleys of the Caucasus there is an Aryan race—viz., the Os of Ossethi, which calls its people "Iron," and this name probably arises not alone from their present use of that metal, but originally is based on the symbolism of language embodying in the structure of certain words not only a characteristic of the Aryan race, but also the correspondence therewith of certain properties with which that metal of all others is supremely endowed, the names of both having grown out of the old Aryan verb *ar, er, ir, ur, ri, vri, &c.*, as it differently occurs in Sanskrit, and which is found, it is believed, without exception, in every Indo-European language, having the like signification—viz., to go, to enter, to penetrate, to pervade, &c., whence to plough, to penetrate the earth as does the plough; an instrument whose existence has been traced back to the earliest period yet found possible to investigate—a period distinctly recognisable as existing before the related offshoots of the original Aryan tongue had

* "*Ancient Hist.*," p. 35.

begun to exist—before Sanskrit was Sanskrit, or Greek was Greek.* “That there was such a period,” says Max Müller, “we can doubt as little as we can doubt “the real existence of fern forests previous to the “formation of our coal-fields.” By dissecting the allied tongues, and collecting the roots and words which are common to each, we are able to some extent to extract somewhat of the original or parent language from which the allied tongues have descended; and if we extract, too, the true genius of the words in the oldest form we find them, we are able to sketch the character and life of the parent people. That this has been to a great extent effected by the students of comparative philology is probably well-known, and needs no proof at this place. Particularly has this been effected in respect of the Sanskrit, Greek, Latin, Gothic, Celtic, and Slavonic dialects, and it is strange that, after the following deduction which Max Müller has drawn from

* In the Ode of Jayadeva, the great lyric poet of India, describing from the Puranas the two principal Avatars of the Deity, the Supreme God is called Heri, *i.e.*, Lord of conquest, and among the Greeks the Supreme Goddess is called Hera. The following is the eighth Avatar:—

“Thou wearest on thy bright body a mantle shining like a blue cloud, or “like the water of Yamunà tripping toward thee through fear of thy furrow- “ing *plough-share*, O Césava, assuming the form of Bala-Râma; be victorious, “O Heri, Lord of the Universe” (Sir William Jones’ “*Asiatic Researches*,” vol. iv., p. 14, ed. 1807). “Heer, Herus, Heren, Haren in many languages “betokened something noble” (Holwell’s “*Mythological and Etymological “Dictionary*,” p. 218, ed. 1793). The philological connexion between the names of the Supreme Gods and the words for the metal Iron are of extreme interest, and the reason for this connexion is evident, when we perceive what is the fact, that Iron is the King or Supreme of metals—it alone existing in greatest quantity, and alone endowed with those properties, by which every other known material, with the exception of a few of the harder gems, is subject to its influence. It is, indeed, Supreme among substances, as Heri is Supreme among the Gods; and as the God is noble in his supremacy, so also is Iron noble by virtue of its innate concentration of sway.—*SR. J. V. D.*

regions, too, wherein generally he is *facile princeps*—he should so forget it as to contradict so flatly, as we have, in an earlier page, shown he has done. In this connexion he lays it down thus* :—

“ The words which have as nearly as possible the
 “ same form and meaning in all the languages must
 “ have existed before the people, who afterwards
 “ formed the prominent nationalities of the Aryan
 “ family, separated ; and, if carefully interpreted, they,
 “ too, will serve as evidence as to the state of civilisa-
 “ tion attained by the Aryans before they left their
 “ common home. It can be proved by the evidence
 “ of language, that before their separation the *Aryans*
 “ *led the life of agricultural nomads*—a life such as
 “ Tacitus describes that of the ancient Germans.
 “ They knew the arts of ploughing, of making roads,
 “ of building ships, of weaving and sewing, of erecting
 “ houses ; they had counted at least as far as one
 “ hundred. They had domesticated the most impor-
 “ tant animals, the cow, the horse, the sheep, the dog ;
 “ they were acquainted with *the most useful metals*,
 “ and armed with hatchets, whether for peaceful or
 “ warlike purposes. They had recognised the bonds
 “ of blood and the laws of marriage ; they followed
 “ their leaders and kings, and the distinction between
 “ right and wrong was fixed by customs and laws.
 “ They were impressed with the idea of a Divine
 “ Being, and they invoked it by various names. All
 “ this, as I said, can be proved by the evidence of
 “ language. *For if you find that languages like Greek,*
 “ *Latin, Gothic, Celtic, or Slavonic, which, after their*

* “ Lectures on the Science of Language,” Vol. I., p. 273, ed. 1873.

“ first separation, have had but little contact with Sanskrit, have the same word, for instance, for metal which exists in Sanskrit, this is proof absolute that metal was wrought previous to the Aryan separation. Now, metal or ore is *ais* in Gothic, *ár* in Anglo-Saxon, *æs* in Latin, and *a ya s* in Sanskrit, a word which, as it could not have been borrowed by the Indians from the Germans or by the Germans from the Indians, must have existed previous to their separation. We could not find the same name for house in Sanskrit, Greek, Latin, Slavonic, and Celtic, unless houses had been known before the separation of these dialects. In this manner a history of Aryan civilisation has been written from the archives of language, stretching back to times far beyond the reach of any documentary history.”

Further on he adds—“ We may well understand, therefore, how a name, originally applied to the cultivators of the soil and householders, should in time have become the general name of all Aryans. Why the householders were called *Arya* is a question which would carry us too far at present. I can only state that the etymological signification of *Arya* seems to be ‘one who ploughs or tills,’ and that it is connected with man.” To this we would add that its signification is best expressed in our Anglo-Saxon by “one who *fER*-tilises, or *fER*-tills, or *FUR*rows the soil,” that is to say “one who tills with the Iron, or who tills with the *ara* of the Sanskrit.” Now, this Sanskrit word *ara* unfolds, if discussed *à fond*, more than many volumes of writing. At this place we shall content ourselves with but one reference to it. According

to that eminent Sanskrit scholar, Professor Monier Williams, one of the meanings of *ara* is "oxide of Iron"—"Iron-stone" (Sanskrit Dict., p. 127, col. 2). This, of course, proves to us that, before that word could have been invented, an oxide as a source of Iron, and a mode of extracting it from that source, must have been known during this remote period of the Aryan race, which human investigation by Language-science has reached; does, as in parallel investigations of like order among the Semitic and other tongues, point at this early period to people of intelligence; of an intelligence, too, turned to high practical account, and making due allowance for later influences, of just such a nature as we find to characterise the foremost of their descendants at the present day, the result indeed lending no aid whatever in support of the progressive Stone, Bronze, and Iron theory. In connexion, too, with words for Iron, and their allies in the three great stems of language, there is a general similarity of idea or genius involved in them, typifying again from a further and more accurately suggestive point of view the fact of their being derived from, or the children of, a still older common tongue—the one primeval language of the human race; for in the case of the most ancient Aryan, as well as the most ancient Semitic and Chinese words for Iron, and their connexions, the idea of an all-pervading, all-compelling, or all-attracting somewhat connects this subject with the extra-mundane, or Sidereal Heavens, the Earth and EnFERs;*

* See the Psalmist:—"Fast bound in misery and Iron."

extending, in fact, through the whole Physical Universe—an idea included under the well-known and celebrated axiom ascribed to Hermes* Trismegistus—

“ Omnia quæ in Cœlis sunt in Terra, Terrestri modo;
Omnia quæ in Terra sunt in Cœlis, Cœlesti modo : ”

the truth, indeed, of which has only in the last few years been verified by researches into the chemical constitution of the Kosmos—we refer to those classic investigations by Spectral Analysis—which have proved this axiom literally true. It is not too much to say, with the prophet of old, that as “ Iron breaketh in pieces and subdueth all things ” (Dan. ii. 40), so it everywhere declares its universal dominion: discovered by Professor Nordensköld in snow; by Phipson in a south-west gale; by Baumhauer in hailstones, but more especially by Wollaston, Fraunhofer, Stokes, Kirchhoff, and Balfour Stewart in the Sun and Stars. In short, Iron everywhere asserts its universal presence.

We must reserve for another place and time our excursus into the realms of the inner and recondite signification of words for Iron in every language, which contain Truths that would fill volumes, contenting ourselves for the present with the mere hints contained in the foregoing remarks, and repeating here our conviction, that in the deeper recesses of philological investigation alone, when the true genius of each particular tongue shall have been eliminated, will be found the key with which to unlock the innermost

* “ Zeus and Hermes were originally the same, and therefore, as the Supreme God, corresponded to Heri of the Puranas. The Chaldeans and Egyptians “esteemed Hermes as the chief Deity, the same as Zeus, Sol, and Adon” (Holwell’s Dict., 220).

shrines enclosing that true picture of our earliest forefathers, a picture now anxiously waited for, that when unfolded, its Real Light may shine out in presence of the latter-day creed of evolution, which even at best is by one of its foremost and latest advocates, after endless attempts at proving, acknowledged to be still unproved.* Is it not a little unreasonable then that in condemning their fellow-men for past belief in what is sarcastically defined as a "blind faith," regarding which nothing can be proved, the evolutionists seem to overlook the fact that the faith they attempt to establish is also "blind," for the simple reason that in the end they are compelled to admit their inability to find the ultimates, the fundamentals upon which the theory rests? Nothing is more instructive in this respect than the following summing up by the German Apostle† of the evolution doctrine—namely, "We admit this process, so long as it "is not directly observed or repeated by experiment, "*remains a pure hypothesis*;" and this being so, we are certainly entitled to pause and consider, leaving all other considerations out of the question, whether of the two it be more reasonable, on the one hand, to have Faith in the doctrine of an unproved beginning in "*primeval mucus*," out of which Man has developed through creatures of every form, both aquatic and non-aquatic; or, on the other, that Man is the lineal descendant of nought but his like from the beginning, the highest of animal creation, in every way noble at the commencement, having doubtless under-

* "History of Creation," by Ernst. Haeckel, vol. i. p. 348.

† Haeckel, *op. cit.*

gone for a while degradation, out of the abyss of which, for some untold ages, he has striven, and is still striving, by continual effort to return.

To sum up the results of our investigations, we have to repeat that all the oldest languages examined in the preceding chapters, and which we have used as the only instruments capable of conveying us back, as near as it is possible to get by all known existing means, to the time when tradition generally ascribes man to have made his entry to this fair world, clearly record the use of Iron in the remotest periods they touch; so that if such use is really capable of being fairly held (as it has, in the past, by many been considered) to be a conclusive test of the degree of man's civilisation (which, indeed, can scarce be now allowed, for when evidence of its occurrence is met with, this at most only shows that the metal was within reach of those peoples who have left us their record of it), then the earliest Oriental nations were beyond doubt civilised beings. But we are challenged with this, that the evidence dealt with exists only on the face of the earth, and is no proof of what other evidence is lying buried deep down in the alluvial deposits of the great Eastern rivers, the banks of which were the sites of human dwellings in the ages preceding the monuments which remain. Truly this is so, and truly we admit that if there did exist those hypothetical nations of a period older than the above ground relics, then we should certainly expect to find them in the alluvial beds or the deltas of those rivers. Yet what reply do these beds or deltas give? We will appeal

to the Nile, the Ganges, and Jumna, whose deposits alone have been systematically examined, and the results of the careful excavations of Leonard Horner, Hekekyan Bey,* Falconer, and others, decisively refute the idea of human beings dwelling in those localities prior to the era of the builders of the first, and for all time, in point of structure the most perfect monument ever erected. Furthermore, the History of Egypt, from Menes the Founder downwards, was never that of a race rising higher and higher again from lower types, but high, extremely high, intellectually at first, and through all subsequent time sinking intellectually lower. This is true also of all the earliest nations we know aught about.

In regard to the preceding portion of this chapter, it may by some be thought that we have ventured needlessly out of our path in dealing with the geological evidences, yet we have touched upon them in order to avoid the charge of passing by a testimony, which, if it had been left alone, would almost to a certainty be flaunted against us as invalidating the results we have deduced from other testimonies, whereas we think it will be allowed that geology does not, when carefully examined, contain such refutation. The geological record, when interpreted in the light of the facts and the law we have discussed, certainly cannot be read as lending countenance to the progressive theory of Stone, Bronze, and Iron Ages, for the instances met with, wherein in cave and other deposits stone implements alone occur, is decisive evidence of one of two things only—namely, that

* Phil. Trans. vol. 145, p. 105. Also, Quarterly Journal Geological Soc. London. 1865.

Iron did not exist in the neighbourhood from which those deposits were brought, or that the deposits are old enough to cause the disappearance of Iron articles by oxidation.

Lest it should be thought that in what we have advanced it has been part of our scheme to wilfully support the apparent chronology of the Jewish Scriptures, we take the opportunity of distinctly denying any such wish or intention. That we do not read the account of creation therein with the full understanding is clear, when we survey certain facts which modern science has brought to light, those for example respecting the immensity of the Universe, containing, as it does, Suns and Stars, whose distances are so great that their light can reach our Earth only after the lapse of hundreds of thousands, perhaps millions, of years (which, as a physical fact, is quite at variance with the chronology of creation which Man has up to the present moment deduced from the Hebrew record), but that what it professes to teach as to the era when Man was created is approximately true, upon that all ancient testimony seems to agree: and when, by those persons who, lacking the necessary technical knowledge to judge correctly of the evidence which has been presented to them, and especially deficient in metallurgical science, the appearance of the metal "Iron" has been argued as a crucial test, we cannot do better in concluding than quote here, as we are permitted to do, in respect of the unsoundness of this view respecting the use by mankind of the King* of Metals, the

* If we analyse the names of the Supreme Gods and Kings of the most ancient nations, we find that the root of the word Iron is a leading constituent in them. The same remark applies to the names of some of the chief animals.

following extract from a letter addressed to the author by one of the highest living authorities on metallurgical questions:—

“ Harlsey Hall, Northallerton, 29th Sept., 1875.

“ DEAR SIR,—I have long entertained the opinion that Iron
“ must have been well known to the ancients, and that its comparative rarity in ancient buildings, &c., must be ascribed to its destruction by oxidation. Were our gigantic blast furnaces and forges necessary for the production of this metal, then we might well understand the ancients could have had no knowledge of Iron, but it happens, with perhaps the exception of Lead, it is the most easily reduced of all the metals; certainly the smelting of Copper is a much more complicated process than obtaining malleable Iron direct from the ore, which latter, as you know, is practised by many savage nations. But Copper alone did not suffice for Bronze; a second metal, Tin, was also necessary. This latter no doubt is readily obtained from its oxides, but looking at the rarity of this ore, I cannot think that the more abundant sources of Iron, from which their metallic content is so easily obtained, would not be more frequently appealed to than has been generally supposed.

“ I remain, yours faithfully,

“ I. LOWTHIAN BELL.”

APPENDICES.

APPENDIX A.

With reference to the footnote on page 23, we quote the following paper from "Iron," dated February 27, 1875, page 269 :—

IRON MASSES IN GREENLAND.

An interesting discussion has been going on in Germany with regard to certain blocks of iron found a few years ago in Greenland, near a mass of basalt, and of similar blocks in the basalt.

M. Nördenskjöld, who first brought word of them, thought they were of meteoric nature. M. Wöhler and M. Daubrée were of the same opinion, after minutely examining the iron. The masses were found, indeed, to be different in some respects from all meteoric iron previously met with. While they presented the usual Widmannstaedten figures, on action of acid, like undoubted meteoric iron; and contained a certain amount of nickle, which is characteristic of iron masses of meteoric origin; analysis showed there were also present a considerable amount of carbon, and a large amount of an oxygen compound of iron, probably magnetite. These bodies had never before been found in such proportion in meteoric iron.

If only these loose blocks of iron had been found lying at the place named, probably no doubt would have been felt about their meteoric origin, notwithstanding the dissimilarity to meteoric iron just noticed. But the discovery of quite similar blocks in the mass of basalt compelled more caution. It is, of course, not impossible that just at the time the liquid basalt was ejected, a shower of meteoric stones fell. This coincidence of two uncommon phenomena at the same point has, indeed, little probability, still it is not impossible. And this is the view M. Nördenskjöld took;

he supposed the stones of the meteoric shower to have plunged into the liquid basalt and so got embedded; afterwards, through weathering, some of them were liberated.

But many minds hesitated to accept this view, especially as there was another explanation possible. The blocks of iron might have been brought up from the depths along with the basalt; in the course of time some would be liberated through weathering, others would remain embedded. If this had been the case, then the phenomenon described would afford a long looked-for parallel to the fact that many basalts bring up from the depths lumps of olivine, which are very like meteorites. This was the state of the question when an expedition was charged, in 1871, to bring home the iron blocks which M. Nördenkjöld had been obliged to leave behind, and M. Nauckhoff undertook to make further observations on the mass of basalt.

From M. Nauckhoff's report, it appeared that the phenomenon was more complex than had been supposed. In the mass of basalt were enclosed not only flat and round pieces of iron, but also pieces of a doleritic rock, which, again, contained particles of massive iron and troilite; finally, there were in basalt little balls of troilite, covered with a mineral of the nature of hisingerite. M. Wöhler and M. Daubrée had already called attention to the compound of silicates attaching to the iron pieces they had examined. And now greater quantities of these were met with, in part free from iron. M. Nauckhoff found, also, that the doleritic pieces enclosed were quite different from the surrounding basalt, and were of similar composition to the meteorites of Juvinas, Jonzac, and Stanner, formed of augite and anorthite, which compound M. Rose had called eukrite; further, that the troilite had a similar composition to that in many specimens of meteoric iron.

From these data, the explanation might be deduced (according with that of M. Nördenkjöld), that a shower of meteorites, consisting of eukrite, as well as iron troilite, had entered the basaltic mass, when this was yet liquid. But the new observations also favoured an explanation in the other direction indicated.

It is true, the enclosed pieces of iron, eukrite and troilite, were similar to the corresponding constituents of known meteorites, but they were only similar; there was not perfect agreement in any

case. All three were considerably different, in petrographical and chemical relation, from those in previous meteorites.

M. Nauckhoff calls attention to the fact that the doleritic masses found, have, in many cases, a crust or rind, which is chemically and petrographically different from the interior. This, again, is not favourable to the view that these were meteorites, for the latter present (as might be expected from their fragmental character) no such layer.

As regards the occurrence of stone and iron masses in the basalt, this seems equally to favour both views. The occurrence, indeed, of little balls of troilite, which are seldom so big as a pea, might, perhaps, raise a difficulty for the meteorite-hypothesis; because, suppose the ejected basalt to have already acquired a crust when these small bodies fell on it, they would not sink into it; and supposing there was no crust, and that the basalt was so liquid that they could penetrate it, the large iron lumps would have sunk to a greater depth. Still, as the condition of an eruptive mass cannot be at all points the same, and as the troilite falling in thick shower with the iron, or connected with it, might be carried in, this difficulty may not be regarded as serious.

The subject has been taken up by the eminent mineralogist, M. Tschermak. He has made a comparative examination of the meteoric eukrite of the meteorites named above, and the eukrite of Ovifak, of which he received specimens, some of the kind containing iron, others without iron; he also examined pieces of the surrounding basalt. The results of his examination (communicated in *Mineralogische Mittheilungen*) are briefly as follow:—

The metecric eukrite and the eukrite of Ovifak present considerable differences of character, and the question is, what weight must be allowed to these differences in deciding the point? The structure of the meteoric eukrite is tuff-like, that of the Ovifak stone quite compact. Such differences, however, are often found in known meteorites. The ordinary meteor stones, chondrites, are frequently tuff-like; others, chemically resembling them, compact and crystalline.

The component parts show great difference in texture and enclosed pieces (*Einschlüsse*). The characteristic fine brown and

black microscopic particles enclosed in meteoric anorthite, are entirely wanting in one of the Ovifak specimens. But as such occur in the other, though in less quantity, the difference is, perhaps, not specially important. The augite in the stones of Ovifak is without characteristic enclosed pieces; that of meteoric eukrite has frequently such (passing as oblique streaks through the small columns of augite, and, with greater magnifying power, resolved into violet or brown dust-like particles). This difference has no special significance, as not all meteoric augite has these enclosed pieces. There is a striking difference in the form of the augite. All meteoric augite shows individual crystals, little columns, whereas that of Ovifak has no such form, but merely fills up the gaps between the other minerals; an occurrence not known in meteorites, but characteristic of dolerite, gabbro, and diabase. This feature of the augite in the Ovifak stone favours the opinion of a telluric origin.

As regards the iron and troilite present, there is merely a difference in relative quantity, which cannot be of much importance. The occurrence of magnetite and graphite, on the other hand, which are wanting in meteoric eukrite, is a peculiarity of the Ovifak stone, which is, for the moment, striking. When we consider, however, that the greater mass of the enclosed pieces in Ovifak stone are of iron, which is rich in these bodies, and that the composition of this iron does not contradict the supposition of meteoric nature, it must be allowed, that here a comparison with meteoric eukrites falls away.

The fact that the stones found show difference of structure and composition does not agree with the opinion that they are of telluric origin; for such have never hitherto been met with in basalt-enclosed pieces; on the other hand, we have here a similarity to meteorites, inasmuch as, in several meteoric showers, which have furnished many pieces, such dissimilarities have also been observed (Stannern, Pultusk). The occurrence of a crust-layer (of which M. Nauckhoff speaks) favours neither the one nor the other hypothesis. It is to be remarked that the phenomenon does not occur so constantly and distinctly as to have special importance attached to it. In the specimens I examined, I found no such crust; I consider the phenomenon accidental.

The internal nature of the Ovifak stones, therefore, presents nothing contrary to previous observations of meteorites; only the mode of occurrence of augite is similar to that in earthy kinds of rock. On the other hand, the hypothesis of telluric origin is opposed by the fact, that hitherto nickle iron, as a constituent of earth rocks, has never been met with, and as little the union of such iron with troilite and graphite.

APPENDIX B.*

THE MANUFACTURE OF LARGE MASSES OF IRON IN INDIA.

Mr. Mallet's article in *The Engineer* of the 15th ult., on the very singular iron column within the mosque of the Kutab, near Delhi, is one which cannot fail to be particularly interesting to all students of the history of iron metallurgy, and is certainly in great measure exhaustive and complete. Mr. Mallet, however, whilst coming to the conclusion that this monument is of malleable metal, seems yet inclined to suggest the possibility that at some distant date the iron workers of India may have had a knowledge of iron in its liquid form, which at present they do not seem to possess, and of which knowledge history affords us no record. Mr. Mallet's great difficulty—and at first sight there can be no question that it is apparently an insurmountable one—is that, assuming the column to be of wrought iron, of forging such a mass of metal at a welding heat by the mere manual power within reach of Indian iron workers at the supposed date of its manufacture. The experience of many years spent in charge of an iron works in Southern India, where cast iron was produced by the European method, but which experience also comprised constant intercourse with the native smiths of the country, and a knowledge of the material they used, and of the method of its production and capabilities in manufacture, may perhaps entitle the present writer to offer what he ventures to believe will be considered by practical men a satisfactory explanation of how such

* From *The Engineer*, vol. xxxiii., pp. 19 and 20.

material, labour, and capabilities might have been used to produce the column now under notice.

In the first place, then, the writer would record his decided opinion that the column of the Kutab is of wrought, or at all events is of malleable iron; for during the whole course of his Indian experience, which included many visits to the native smelting furnaces in the Salem and Malabar Collectorates, together with the constant practice at his own works in the production of *edged*, not *chipping* tools, of the native steel; he never found anything approaching an attempt to *tap* one of these furnaces, nor heard any Indian workman speak of cast iron but as of a material utterly useless to him, and beyond his ken.

The process of smelting, as pursued in Southern India, is probably sufficiently well known not to require any further description here, than, that in a perpendicular circular furnace about 6 ft. or 8 ft. in height, and of a diameter at its greatest width of about 18 in.—the blast to which is supplied by the alternate inflation and compression of four or six goat skins worked by hand, as in the ordinary smith's fires of the country—the black magnetic oxide so common in the laterite formation is converted not into cast iron, but rather into a mass somewhat similar to the loup of the Catalan forges, presenting in parts a crystalline and in others a fibrous fracture. The removal of these lumps—"mootees" they are called by the natives of Malabar—or louns, necessitates the breaking open of the whole of that part of the little furnace which corresponds to the tymp and fore hearth of an English blast furnace; and in order to prepare for this the charging at the top is stopped, as is also the blast, and the whole contents allowed gradually, as combustion exhausts itself, to sink down into the hearth, whence, when cool, it is removed. These louns or mootees (the writer must object to Mr. Mallet's term "pig," as applied either to these or any result of the cementation process, as the term certainly conveys to English ears at least, the idea of cast iron) are generally from 80 lb. to 112 lb. in weight, and it is from the building up of lumps of metal such as these, one upon the other, with such reheating and hammering as may have been found necessary to effect cohesion, that the writer conceives the Kutab column to have been produced. He cannot think that there is

anything impossible in such a mode of proceeding, nor anything in the actual working of the material—which is of a most malleable nature, and weldable at a very low comparative heat—which the native smiths are unequal to performing. Fifteen inches diameter is certainly a very, very large bar; but it should be recollected that in the process just suggested it would only be the surface of each successive mootee (previously, of course, heated and hammered to the proper section) which would require to be at welding temperature, and that such a temperature for such surfaces might readily be produced in good charcoal fires without much injury to the iron so treated. The writer has himself seen shafting of between 6 in. and 8 in. diameter heated in open fires composed of charcoal and “bratties” (sun-dried cow-dung), and welded to good joints by native smiths in the Madras Presidency. Conceiving, then, that the column may have been thus built up—and of course this supposition is directly opposite to the idea that it might have been composed of longitudinal bars welded together—we find the capital left to be accounted for; and the very form of this, is one which could readily have been produced by swaging, and finishing with such chipping (but this only to a small extent, the writer believes) as may have been found necessary. It is also to be recollected that the column itself has never, save, of course, in the act of raising it, been submitted to any severe strain, and that its cohesion has never been in any way tried in tension, as in ordinary shafting. Further, the extraordinary amount of quiet perseverance with which the natives of India are endowed, and the illimitable amount of mere manual labour which any great Eastern ruler could bring to bear upon such an object of ambition as the construction of a trophy or monument as this column may be considered, would all go to help us to the conclusion that this huge rod of iron may have been manufactured in such manner, and with such material and appliances as the writer has described. Again, it may be remarked that, even supposing other similar columns to exist, as Mr. Mallet seems to think, yet even this very existence, in so confessedly small a number, proves them to have been quite exceptional productions, and not in any way portions of a systematic manufacture of large iron forgings. It is, too, a point well worthy of notice, that there would seem to be no

examples left of what might be described as the intermediate stages of iron-working; *id est*, examples of forging which, whilst exceeding greatly in size and weight the present ordinary productions of the Indian iron smiths, would yet be of far smaller dimensions in every way than this column of the Kutab; for the large beams mentioned by Mr. Mallet can scarcely be classed in this category. The writer is therefore forced to the conclusion that this, and also the similar columns spoken of, must be regarded as purely exceptional productions—types of no manufacture ever extensively or usefully existing in India, and indicating neither the possession of machinery calculated to produce such types in any number, nor even much smaller forgings. Exceptional, however, as they may appear to be in every way, he yet ventures to believe he has pointed out the process by which, in all probability, they were manufactured; and if they can be regarded but as mere monuments of some now nameless ambition, they are yet wonderful examples of that ant-like perseverance and patient industry which in many ways mark the metal workers of India.

GEORGE M. FRASER.

P. S.—May not the words “mixed metal” mean a mixture apparently of wrought and cast iron, which is clearly the characteristic of the crystalline and fibrous fracture of the native lumps or mooties; and has the great depth, and consequent weight of the column under ground, been used as a counterpoise in raising it into a perpendicular position?

According to the *Mining Gazette*, published at Salt Lake City on June 28, 1874, a writer in the *United States Railroad and Mining Register* suggests, as a solution of the problem, how this huge mass of iron was produced at so remote a period, that “the column may have been forged standing, by welding on, one over another, thin iron plates or dires, the fire being built around the column as it grew, and the ground raised in a mound to keep the top of the column on a level with the work place.”

APPENDIX C.

ON THE RECONDITE NATURE OF THE IRON LÂHT.

In Chapter VI., which deals with archaic Iron-working in India, we have dwelt at some length on that remarkable monument—the Iron Lâht, at Delhi, and we have there, whilst paying more especial attention to the evidence regarding it which has a particular bearing upon the main purposes of this book, inevitably been brought into contact with allusions to the recondite significance of this unique pillar. Whilst, then, in very much of modern thought, and no less so in most modern books, it has become the practice to shun as deadly poison everything that for a moment appears to jar with ideas and fashions inculcated by the conventional usages of our latter times—or rather, which, if truly sifted, would point out how much of what, under the garb of conditions, we have elaborated, and boastfully laud as our modern civilisation, is based on foundations which, if bared to the sight of most of us, would attenuate almost to the annihilation of much that we admire in ourselves, praise in others, and extol in the things which form the principal, and sometimes even the most sacred, of our surroundings; and whereas the direct result of this practice has been to create a vast structure of superficialism to promote the growth of a living dread (called orthodox in some high quarters) forbidding us to look below this surface of things; and whereas the precise nature of this Lâht and its import has been thus fashionably shunned in what has hitherto been published concerning it, we deem it to be our duty, when the occasion presents itself, to throw out at least a hint at that which others, unfettered with the dogmatic follies of what human vanity and priestcraft have called orthodoxy, and who prosecuting researches into the partly unknown, or rather, into the wilfully misrepresented things of ancient religious usages, with that fearless inquiry, the result of a truly reverential spirit, have evolved concerning the entire import of the Lâht. Some may think that such exposition confessedly has no direct connexion with the matter discussed in the body of this volume.

When we assert that the Lâht is a most sacred Phallus (Baal or

Bel), the type of the Male fructifying force of Nature, and that its entire character penetrates to the very foundations of this even now widespread form of religion (the Phallic), those persons, of whom there are, unfortunately, not a few, lacking the charity to allow of free inquiry, will brand us with epithets of no measured virulence, and this subject as a deadly pestilence. Yet let all who do so, and others, remember that this especial matter is now attracting the almost universal attention of the learned and inquiring, and that from the noblest standpoints of philosophical research. Doubtless the worship of the fructifying or generative forces of Nature has been, in the progress of time, degraded not unfrequently to the lowest degree, and so has every other religious practice, even our own Christianity, this latter, in the early days of the Church, and even in our own times, being made the servant for wretchedest political achievement.* There probably never was a religion free from this particular taint; but although defaced and disfigured by the gradual accession of surroundings, as a religion presented to us long ages after its origination must be, we are not to suppose that in such condition it is the reflex of the mind and heart of the Founder, or his intention as the outcome, any more than that the azure or green appearance of the water of some peaceful lake is the true colour of that water. We must in this case look to the causes—to the sky above; the vegetation which clothes the surrounding hills. And so, in what may appear to us the strangest of religious phases, must we analyse the conditions with which they have been brought in contact ere we can strip them of their impurity, and thus filtering them through the sieve of Truth at last behold—the pure unvarnished Proto-type.

In the case of the Phallic religion, there cannot be a doubt that, as a purely rational product, it was, at its origin, of the loftiest and purest ideal the human mind at the time was capable of evolving. It was the outcome of that hankering, deep-seated in man, leading him through the eye of reason alone to a recognition of an Infinite and First Cause. Indeed, it is not too much to say, we believe, that no religion was ever really impure at its origin. We are tempted to think otherwise, because we view the thoughts, acts, deeds, and rites of other religions from the con-

* Draper's "Intellectual Development of Europe."

tracted standpoint of our own narrowed vision as seen by the surroundings of to-day ; but if we can, after determined struggle—for it is not otherwise to be achieved—divest ourselves of this surrounding, and the encumbrance it inculcates, to a perception of the truth, so that we may see, as it were, with the eyes, and feel with the heart with which the founder felt, we then, and only then, have as much as a remote chance of understanding what any religion really was, or what faith its rites implied.

In that truly great work of Max Müller's ("Introduction to the Science of Religion")—a work which not only is to many minds naturally prejudiced* by its title, but which we had opened with no uncertain feelings through finding that in other places where its author had travelled on grounds which he had not made his own, he so lamentably wallowed out of the fair road to the Temple of Truth ; a book which, of all his past writings, will probably live longest ; which pourtrays that depth of love for his work which has enabled him, by patient, ceaseless endeavour, to search after and bring to bank certain innermost jewels of man's self—shining brightest where least expected, and dazing with light reflected from a vast constellation of evidence ! This author says :—"The intention of religion, wherever we meet it, is "always holy. However imperfect, however childish a religion "may be, it always places the human soul in the presence of God ; "and however imperfect, and however childish the conception of "God may be, it always represents the highest ideal of perfection "which the human soul, for the time being, can reach and grasp. "Religion, therefore, places the human soul in the presence of its "highest ideal ; it lifts it above the level of ordinary goodness, "and produces at least a yearning after a higher and better life—"a life in the light of God."† But—and if we degrade the ideas which the prototypical followers of any religion cherished and revered—if, with our vision narrowed with the encumbrance of a blindness which a selfish orthodoxy has fostered, we are unchari-

* We say "naturally prejudiced," for in view of what is understood by "Science" it seems to the untaught mind most unnatural to connect the term with Religion ; but the Truth dawns on us when we see the stricter meaning of the application.—S. J. V. D.

† "Introduction to the Science of Religion," p. 263.

table, and render obscure those mysteries of life which others in a former age not only saw to be God-given and actual—nay, but regarded as pure, in which aspect they evidently were regarded, before polluted by lust and degrading thought. "Let us not," says Alexander Wilder, "add to injury by endeavouring to cast upon them the reproach which belongs to those who thus calumniate them." *

The investigation of the beginning of a religion is never the work of infidels, but of the most reverent and conscientious minds.

To prepare ourselves to aright approach the matter in hand, we have to keep in foremost view the fact that in *primeval times all things and acts which were natural were not considered impure*; on the other hand, that *all that was natural was sacred*, and that *pre-eminently so were the generative organs*, these being dedicated, especially the Linga, Phallus, or Male generative organ, as holy to the God, the Great Creator; that the religious practices wherein these types or symbols were used required absolute holiness and purity on the part of those engaged in them, and that it was a latter-day phase which, with the growing corruption of human nature, sought to establish a system virtually inculcating the worship of the creature more than the Creator, and furnished a pretext for the practice of unrestrained licentiousness, as part and parcel of religious rites.

The ancients "worshipped the Supreme Being," says Wilder at another place, "as the Father of men, and saw no impurity in the symbolism of parentage to indicate the work of creation. What is divine—to be and to do—cannot be immoral and wicked to express. No man formed of woman can with decency impugn the operation of that law to which he owes his existence, and he is impious beyond others who regards that law as only sensual. We may easily perceive how the Phallic emblems were adopted to denote the kinship of mankind to the Creator. Those who employed them apprehended no wrong in so doing till impurity of life had caused all that related to the subject to be considered indecorous."

We are indebted for the following important extract on this

* "Ancient Symbol Worship. Influence of the Phallic Idea in the Religions of Antiquity." New York: Burton, 1875.

head to the work* of an anonymous author, who has favoured us with a copy :—

“The worship of the Lingam, then, of which the *Pillar Tower* was, as has been said, a gigantic figure, involved and signified the worship of the MALE Principle of the Universe ; this worship though afterwards perverted, originally (as has been intimated) intended the worship of the True and Only God ; in accordance with which assertion we find that one interpretation of the word JEHOVAH, undoubtedly signifies the UNIVERSAL MALE. In India this signification is found to be involved in the NAMES of the principal deities. Thus, according to Sir W. Jones (*Asiatic Researches*,† vol. i., p. 232), BHAGAVAT signifies the FIRST MALE ; and NARAVAN, or *on the moving waters* (vol. i., p. 242). *The Spirit of God*, is often likewise denominated the PRIMEVAL MALE. The deity described in the fourth Veda as *Mahapurusha*, also signifies the GREAT MALE (vol. iii., p. 376). Accordingly we find that the definite form of Temples in honour of this Universal Male Power, were *always* erected in the figure of its representative, the Lingam ; that is to say, in the form of a *tower or column*.‡ Almost innumerable examples of such like edifices abound in ancient countries, where this worship was either primitive, or introduced at later periods, and fully illustrate these facts.

“Wilford remarks (vol. iii., p. 365) that ‘the Phallus was publicly worshipped by the NAME of BALLESWARA LINGA, on the banks of the Euphrates. The cubic room in the cave of Elephanta, likewise contains the Lingam (vol. iv., p. 413), as does also the pagoda of stone at MAHERBALIPORAM, or *City of the Great Baal*’ (vol. v., p. 69). Sir W. Jones observes (vol. ii. p. 47)—‘Columns were erected, perhaps as gnomons, others probably to represent the Phallus of Iswara.’ Enough has here been cited, without doubt, to dispose both the learned and the unlearned to consider that the true signification of the pillar and tower was in reality such as has here been stated.

“In many parts of the holy writings we find the pillar to have

* “On the Causes of the Original Dispersion of Primitive Nations in Times of Remote Antiquity.” By ИПОКЕТЪ, p. 6, *et seq.*

† The quarto edition is always referred to.

‡ God in His unity.

"been undoubtedly a sacred emblem; as in Isaiah xix.: 'In that day shall there be an altar to JEHOVAH, in the midst of the land of Egypt, and a *pillar* at the border thereof, to Jehovah, and it shall be for a *sign*, and a *witness to the Lord*.'* And this was the especial *form* in which it pleased God Himself to appear, when He *dwelt in the pillar* that went before His chosen people, as solemnly recorded by Moses.

"When, however, pillars were set up to receive the profane rites of idolatrous worship, we find them noticed in Scripture as an abomination, in like manner as their great Babylonian archetype; which, being obnoxious to the wrath of God, as such, was destroyed by *fire from Heaven*, as its blasted and vitrified ruins still remain incontrovertibly to attest. To this peculiar idolatry Scripture refers in the following passages:—Deut. xii. 3: 'Ye shall overthrow their altars and break their *pillars*, etc.' Levit. xxvi. 1: 'Ye shall make ye no idols, nor graven image, neither rear ye up a *standing image*' (Heb. *pillar*). 1 Kings xiv. 23: 'For they also built them high places, and images (Heb. *standing images*) on every high hill.' Ezek. xvi. 17, 24, 25: 'Thou madest to thyself images of men (Heb. *of a male*), and didst commit,' &c. (See 31st verse and following.) Also Jer. xi. 13: 'According to the number of the streets of Jerusalem have ye set up altars to that shameful thing,' &c. The same is also alluded to in the striking history recorded in Judges vi. 32: 'Therefore he called the idol Jerubbaal (or Jerubbesheth, Heb.), *i.e.*, let the *shameful thing* plead.' And a final warning, and most significant counsel, was given to the Israelites by Moses, Deut. iv. 15, 16: 'Take ye therefore good heed unto yourselves, for ye saw *no manner of similitude* on the day that JEHOVAH spake unto you in Horeb, out of the midst of the *fire*: lest ye corrupt yourselves, and make you a graven image, the similitude of any figure, the likeness of *MALE* or *FEMALE*!'"

We have here, then, a brief sketch of this worship, the *Divinitè*

* Later discovery has, however, shown that this particular passage has a most special reference to the Great Pyramid. See "Our Inheritance in the Great Pyramid," by C. Piazzi Smyth, the Astronomer-Royal for Scotland, 2nd edition, wherein the deductions brought about by combination of mathematical comparison with sacred evidence lead to unfoldings over which angels veiling the sight with their wings might almost tremble.

Generatrice, commencing in purity and terminating in shameful practices, which incurred condemnation by the prophet of the One true God—the worship of the God Priapus, the world-wide symbol of generation and FERTILITY, so that our remarks on page 175 are capable of now being the better understood, for the Iron Láht at Delhi, besides numerous buildings in India, the Round Towers of Ireland, Persia or Iran, and of Scotland, the Maypole in England and elsewhere, but pre-eminently the spires of our churches, “are nothing more nor less than existing symbols “ of this Pagan and strange worship. Almost all the great “ relics of antiquity bear traces of this . . . adoration— “ the rock caves of Elephanta near Bombay, the earth and stone “ mounds of Europe, Asia, and America, the Druidical piles, and “ the remains of the so-called Fire-worshippers in every part of “ the world. Even existing popular customs and beliefs are full “ of remnants of this doctrine.*

Whoever, then, would really understand, must determine to set no limit to the field of his inquiries, for he cannot acquire the Truth by confining himself within the arena of the so-called classical and theological curriculum prescribed in the past. To-day, when the truth of all that has been held most sacred is openly challenged by those who are recognised as foremost in science and letters, it is not enough to stand still unless we be wilfully dishonest. It is not enough to say that beyond a certain region we can recognise nothing but misty chaos, unless we be cowards, for there is Truth and no lie there. The Shekinah is hid by the veil. That chaos must we boldly storm and fearlessly explore if we are to do our duty to ourselves and our fellows. “We should “ therefore approach the subject of human faiths and worship with “ candour, modesty, and respect. Men’s beliefs are entitled to so “ much. The unwitting individual may be astonished at behold- “ ing men, the masters of the science and thought of their time, “ adoring gods that are represented as drunken and adulterous, “ admitting extravagant stories and scandalous narrations among “ their religious vanities. In his simplicity he may conceive he “ has a right to condemn, and even to scoff at such prodigious

* “Review of a Discourse on the Worship of Priapus.” By R. Payne Knight, Esq. London: Chiswick Press. 1876.

"infatuation. But the infatuation and absurdity are only "apparent there, in a fuller, profounder meaning, which sanctifies the emblems and legends which ignorant and superficial "man despises." M. R  nan speaks justly, as well as eloquently : "It is sacrilege, in a religious light, this making sport of symbols "consecrated by Time, wherein, too, man had deposited his first "views of the divine world." *

In the spirit which these remarks inculcate, we proceed then to a brief inspection of the esoteric character of the Iron L  ht.

At page 158, we stated it to be a most sacred Phallus or Linga. Let us now see how this is found out. C. Staniland Wake,† who has laboured so successfully in some branches of this subject, has the following in reference to the precise signification of the word "L  ht." He says :—"It appears that the word *Set* means "in Hebrew, as well as in Egyptian, a pillar, and, in a general "sense, the erect, elevated, high. Moreover, in a passage of the "Egyptian Book of the Dead, *SET* is called *TET*, a fact which, "according to Bunsen, intimates that *THOTH* inherited many of "the attributes of *SET*. They were, however, in reality, the same "deities. *SET*, by change of the initial letter, becomes *TET*, one "of the names, or rather the same name, as *SET* agrees with "*SETH*. We have in this an explanation of the statement that "*TET*, the Ph  nician *TAAUT*, was the snake-god *ESMUN-ESCU-* "*LAPIUS*, the serpent being the symbol of *TET*, as we have seen "it to have been that of *SETH* also."

The remarkable connexion of the name *SET*, or *SETH*, with the pillar or column, will be recollected at once by every reader of Josephus, who describes the Pillars which were set up by the descendants of Seth in the land of Siriad.

At another place C. S. Wake has it : "*SET* (Seth) itself meant "the *erect, elevated, high*, and his name on the Egyptian monuments was nearly always accompanied by the representation "of a stone."‡ Again, "The pillar symbol is not wanting to

* "Ancient Symbol Worship," p. 10.

† "Ancient Symbol Worship. Influence of the Phallic Idea on the Religions of Antiquity." By Hodder M. Westropp and C. Staniland Wake. Second Ed. New York, 1875. P. 59.

‡ *Op. cit.*, p. 60—that is to say, a Linga or Phallus.

"Buddhism itself. The columns said to have been raised by Asoka have a reference to the inscribed pillars of Seth. The remains of an ancient pillar, supposed to be a Buddhist Lat (Lâht) is still to be seen at Benares, the word Lat (Lâht) being merely another form of the name TET, SET, or SAT, given to the Phœnician or Semitic deity."

If this derivation by Wake be strictly correct, it would seem to lead us in the direction of verifying all myth with one great primeval standpoint of Faith or Fact recognised by all people in early times.

Ewald has at several places* pointed out the analogy between certain primitive Hebrew (Semitic) religious customs and beliefs, and many which exist in India, and has thereby shown by implication that at some distant age there must have been a transfusion or engrafting of such from one nation into the other. This is also to be inferred from Lenormant.

We have said that this Lâht is the arch-symbol of the Phallic cultus, and on that account was most sacred to the Aryan worshippers of old. Those who are acquainted with the religious usages of the Semitic nations know how important a place the *membrum virile* and the number *seven* occupied in their sight, and we have seen † that one of the traditions connected with the Lâht is that it is composed of *seven* metals. Among the Jews, for example, when swearing an oath, the practice was "to bind oneself by *seven* (things), and therefore presupposes an extraordinarily ceremonious kind of oath. In early days the person swearing deemed it necessary, according to this, to call upon *seven* things as witnesses of his declaration, or as enduring monuments of the truth. It might be *seven* men whom he invoked, or *seven* gods, or else he might touch *seven* sacred objects, or taken *seven* steps to a sacred stone." ‡ Amongst the ancient Indians this last, according to A. Weber, § was the customary practice in concluding treaties. As the sacred erect stones of ancient times, and the Iron Lâht at Delhi, both belonged to

* "The Antiquities of Israel." By Heinrich Ewald. Translated from the German by Henry Shaen Solly, M.A. London: Longmans, 1876.

† *Ante*, page 146.

‡ *Op. cit.*, pp. 17, 18.

§ "Buckhardt's Travels in Arabia," vol. ii., p. 57.

the same cultus, we may easily see how the number *seven* became associated with an object so sacred, and in view of the association of the Phallic with the Sabaistic or planetary worship, it is not difficult to understand how it comes to pass that the tradition of *seven* metals, the types of the then known *seven* planets, were linked with the sacred column. An old Arabic custom mentioned by Herodotus is of a similar type, and at the present day in the Wadi-Munâ, near Mecca, *seven* stones are thrown where *seven* idols formerly stood.* But amongst the Hebrew and Egyptian nations the most solemn oath was taken with the hand upon the *membrum virile*—upon that part of the body out of which posterity proceeded—and was, therefore, most sacred. Thus the person binding another, swearing the oath, referred it to posterity to revenge should he break the covenant entered into. An instance of this occurs in Gen. xxiv. 2, 9, on the occasion of Abraham swearing his servant, that he should not give Isaac a Canaanitish wife, Abraham's command to his eldest servant being—"Put, I pray thee, thy hand under my thigh, and I will make thee swear by the Lord, the God of heaven," &c. Israel makes Joseph swear a similar oath when on his death-bed (Gen. xlvii. 29, 31). In the Egyptian representations of Osiris swearing by his Divine Power, he stands erect with the right hand upraised in precisely the manner practised in the Law Courts of Scotland at the present day when a witness is being sworn; the left hand he rests on his thigh, holding the *membrum erect*. This extremely significant usage also exists now among the Egyptian Bedouins and the Kaffirs,† and according to Vambéry it is still practised among the lower classes in Turkestan. Dr. Ginsburg's remarks in an article on oaths in "Kitto's Cyclopædia" are well worth careful reading in this connexion.‡ We tremble, however, at the further exposition of this subject here, leading, as it does, to that other recondite cultus of the sERpent, with which we have already seen the Låht is intimately connected in the legend respecting Vasuki.

* "*Indische Studien.*"

† "Adventures of Colonel Somerset in Caffraria." London, 1858. Quoted by Ewald, *op. cit.*, p. 19.

‡ See also "Ancient Faiths." By Thomas Inman, M.D. Vol. i., p. 79; also vol. ii., p. 476.

APPENDIX D.

CHINESE IRON MANUFACTURE.

WE have been furnished by Mr. Henderson, the Commissioner from Li-hung-Chang to this country, with the subjoined "Notes from his Diary" during a ramble through Shansi in March, 1874.

STEEL.

Mr. Henderson says: "In formerly writing you, I mentioned that Steel is made at or about Hankow, on the Yangstee, which still is considered very valuable by the Chinese, and brings a much higher price amongst them than the best English or Swedish Steel imported. How this Hankow Steel is made, I cannot say. I saw no Steel made, but some of the Iron is very fine; and when reheated by wood may, no doubt, have some of the properties of Steel."

IRON.

Regarding the native methods of making Iron, Mr. Henderson has succeeded in obtaining much more complete information, as contained in the following, which, to make intelligible to Europeans, he has prefaced with a table of arithmetical values.

CHINESE COINS AND WEIGHTS VALUE.

One tael of silver is valued at	.	.	.	6s. 0d.
Number of cash in a tael, is 1680,	.	.	.	6s. 0d.
cash	280,	.	.	1s. 0d.
cash	140,	.	.	0s. 6d.
cash	23½,	.	.	0s. 1d.

In the calculation of silver money,

10 cash makes one condarin.

10 condarins one muci.

10 muci one tael.

In the weight of coals or other bulky goods—

100 catties is equal to 1 pecul.

1 pecul . . . 133½ lbs. avoirdupois.

16 peculs 80 catties is equal to 2240 lbs. or 1 ton.

IRONWORKS TEN TO THIRTEEN MILES FROM YANG-CHING SHANSI,
CHINA.

On the northern side of the valley stand the smelting establishments. There seemed to be eight or ten of them, with immense heaps of broken moulds before them.

Behind the Ironworks are the low hills, containing both the coal and the Iron ore. Visited one of the smelting establishments; they have been well described by Baron Richtopen and Dr. Williamson. Saw the anthracite coal and the Iron ore. Coals cost at the hills behind the works 20 to 25 cash (1d.) per basket of 80 catties (107 lbs.), and never exceed 30 cash. Iron ore, inferior, cost 20 cash (1d.) per pecul, and for the very best about 50 cash (2d. per pecul (133 lbs.) at the mountain. By a pecul our informant meant as much as a man could carry. In smelting, 100 peculs of Iron ore, if very pure, yields 90 catties of Iron; if slightly inferior, 85 catties; and if common, 80 catties. On a second smelting the Iron loses 10 per cent., some say 5 per cent., and is then made into pots and pans of Cast Iron, but as the goods contain some of the sand, the loss in Iron is only about 5 per cent. The third time the Iron is smelted it is made into bars. By this time the original 90 catties has come to be only 70 catties, or even less, if not very good. To be made into other articles it may be smelted, four, five, or six times, and in the latter case it is fit for needles.

We saw the open furnaces, in which were 66 crucibles, and which take a day and a half to smelt. The smeltings turn out very unequally; the 66 crucibles may turn out 8 peculs in all, if very good ore, and if poor ore only 5 peculs. The produce of the first smelting sells at 5 cash per catty, and the Bar Iron of the third smelting at 16 cash, at this place.

Following the bank of the Ching-ho we came by the river side to some smelting establishments. At this place they did not smelt from the ore, but purchased the Iron after it was smelted at 5 cash per catty, and from this they made their pots and pans. Here they told us that on smelting a second time for castings, the out-turn was only about 70 per cent. of the first smeltings.

At Zuang-yin-san the owner of the mountain carries his Iron to

a distance of 30 li (10 miles), and sells it to the manufacturers at 200 cash for 300 catties, allowing $3\frac{1}{3}$ cash per pecul per li for carriage. This would give the value of the ore of the mines as being $33\frac{1}{3}$ cash per pecul ($1\frac{1}{2}$ d. for 133 lbs.). Kung-san Iron is not so good, 4 taels weight (or 25 per cent.) cannot be got out of a catty.

At these places the Iron is very soft, and in appearance like coarse-grained red sandstone.

At Su-chuan there is a large smelting establishment, the smelting being done in large pits, each holding about 25 peculs of ore. The smelting occupies one day, and after smelting it is allowed to remain in the pit one day to cool; it comes out in one piece, weighing apparently about 6 peculs, and is sold in this state at 5 cash per catty.

They could not tell us how much coal was used to smelt one of these masses of Iron.

The workmen are paid 60 cash per day and food, food consisting generally of small millet and a little salt, no vegetables, and may cost about 20 cash.

This Iron is of the same description as we saw at the Chung-ho establishment, which loses 30 per cent. on being smelted a second time.

Visited another large establishment, where they made principally *Bar Iron*; at the first smelting the ores give 25 to 30 per cent. of Iron. This was smelted a second and a third time for bars, when it again lost 20 per cent., the proceeds of the first Iron giving only 80 per cent. This *Bar Iron* is said to sell at 20 cash per catty. We saw at this establishment many of the little cops of Iron which came out of the crucibles, and they differed greatly in thickness and in weight, being from 5 to 8 catties.

Here we also saw an immense oblong stack of firewood, some $60 \times 20 \times 20$ feet, for use in smelting where *Bar Iron* is to be made.

At Ping-ding Chow, or 7 miles north of it, we entered the first smelting establishment we came to.

They had here in the open furnace 128 crucibles, these crucibles being about 4 feet high, and 6 to 7 inches in diameter. Out of these 128 crucibles they could get about 15 peculs of Iron, equal to about 40 per cent., to smelt which will take about 10 mule

loads of coal—i.e., about 20 peculs or $1\frac{1}{2}$ tons; the produce of the first smelting sells at 5 cash per catty.

At the second establishment we were told that out of the coarse yellow Iron ore they could get 40 per cent., and out of the best dark ore they could get 60 per cent. They were mixing here the two kinds of ore. It was all pounded small before being put into crucibles. In the second smelting, if Wrought Iron is to be made of it, wood alone is used, thus making it fine and tough; for the third or fourth smelting coal is again used.

At a third smelting establishment they were making moulds for pans. The first smelting here will produce about 60 per cent. from the ore, but this contains a great deal of impurity; and upon this being smelted a second time, it will again turn out only about 60 per cent. of the first smelting. The contents of 128 crucibles of the first smelting are put into 63 crucibles, and these turn out on a second smelting enough Iron to make about 50 pans.

Time required for the first smelting, 2 days; for the second smelting, 1 day.

The Chinese idea of percentage of Iron from the ore is evidently a purely imaginary one, for they never weigh the ore. With coal and Iron ore both so plentiful and cheap, the Iron is so much per donkey load, as much as the animal can carry.

Some Iron ore we purchased at Ping-ding Chow, showed, at the Royal School of Mines, London, to contain 50 per cent. of Iron. It is loose hematite, and contains little or no sulphur.

INDIA.

Mr. Henderson at the same time has forwarded the following letter from Mr. Bourne, and has Mr. Bourne's sanction to publish the same:—

66 MARK LANE,
LONDON, E.C., 26th April, 1875.

JAMES HENDERSON, Esq.

MY DEAR SIR,

I have seen the native process of making Iron in many parts of India, and it is substantially the same in all. A furnace—of say 20 inches internal diameter—is built of clay, breast high, and has the pipes of some sort of bellows entering at the bottom; while the charcoal and the ore, broken into small

pieces, are put in at the top. After blowing for some time a hole is opened, about half way up, in the front of the furnace, out of which a large mass of Spongy Iron is taken, and this mass is reheated and hammered into small ingots sharpened at each end, in which state it is sold. The late Mr. Heath informed me that he has seen furnaces in India about three times the height of the foregoing, which furnaces produced Cast-Iron, the sole use of which was to melt with Wrought Iron for the production of Steel, as is now done in the Bessemer process. But these furnaces I never myself came across, and they are not common. The wootz is produced by melting Wrought Iron in small crucibles, into which some twigs and a green leaf from a certain tree are introduced, and the crucibles are then stopped with clay formed into a pyramid, over which a dome is built, and heat is applied, when the Wrought Iron melts and combining with the charcoal of the green twigs forms Steel. Charcoal will not do as a substitute for the green twigs. The Steel takes the shape of half the crucible, and is of the shape and size of half an egg. In making the Damascus blades each piece of wootz was drawn out into a ribband of the proper length, and a bundle of these ribbands was then welded together. This process produces the exact markings to be found on the old Damascus blades.

Regarding the testimony touching the antiquity of Iron, I may mention that shortly after my first visit to India I came across a book of Egyptian hieroglyphics and drawings, where one of the objects represented was the manufacture of Iron after precisely the same fashion as I had seen it practised in India. If I had not been in India I should not have known what was intended to be represented ; but having seen the mode of procedure in India I recognised it at once. I do not now remember what the book was in which I saw this, or what epoch it was supposed to represent. But this, no doubt, could be discovered by any one who knew the Indian mode of manufacture, and who was interested in the subject.

I remain,

Yours very truly,

JOHN BOURNE.

APPENDIX E.

THE EVIDENCE OF FLINTS.

BESIDES "Flints," referred to at page 193, M. Desnoyers and the Abbé Bourgeois discovered in the upper pliocene strata of St. Prest, near Chartres, bones of *Elephas meridionalis* and *Rhinoceros leptorhinus*, engraved with figures of animals; and the Abbé Delaunay disinterred from the upper miocene strata of Pouancé (Maine-et-Loire) and of Thenay (Loire-et-Cher), bones of a fossil cetacean marked by transverse notches made with a cutting instrument.*

The following notice of the discovery of certain "flint implements," of an age supposed at first to be prior to the boulder clay, appeared in the columns of the *Standard* of October 12th, 1876; and as it led to a most important correspondence on the subject of Flint and other implements, showing the most recent statement of the phases of difficulty on both sides, we here reprint the whole, especially directing attention to Mr. Whitley's letter of October 26.

GEOLOGICAL DISCOVERY IN NORFOLK AND SUFFOLK.

Mr. Sydney B. T. Skertchly, of Her Majesty's Geological Survey, who is stationed at Brandon, Suffolk, has recently discovered some flint implements in that neighbourhood in beds formed before the close of the glacial period. A party of Norfolk and Suffolk geologists and archæologists recently accompanied Mr. Skertchly over the district to examine the beds from which the implements were obtained. There is an extensive plateau of chalk around Brandon, with here and there a depression, in which Mr. Skertchly found boulder clay deposited by the agency of land ice, as shown by the character of the boulders. Under this boulder clay in some sections are seen beds of loam, brick earth, and sand; and it was from these beds that three flint implements of rude type had been obtained. One was picked out of the bed in a pit at Culford, Suffolk, by Mr. Skertchly himself, and two others were dug out of equivalent beds in a pit at Botany Bay, on the Norfolk side of Brandon, by a workman. The party under the

* Trans. Internat. Congr. Anthropol. Paris, 1867.

guidance of Mr. Skertchly satisfied themselves that the beds said to have yielded the implements were older than the boulder clay deposited by glacial action. At a dinner in the evening Mr. Skertchly gave a narrative of his discovery. He said that not long after he came into the Brandon district a man working in the Botany Bay pit gave him a rolled Celt, at which time he was not aware that the bed from which it was obtained was of an age prior to the deposition of the boulder clay; he thought it was of the same age as the gravel overlying the chalk. Some time afterwards, when in company with Mr. Geikie, author of the "Great Ice Age," he received another undoubted implement from the same bed. It was not till he himself found another implement at Culford, and saw the boulder clay above the bed from which he extracted it, that the importance of the discovery dawned upon him. Alongside the Culford implement he found a deposit of broken and scraped mammalian bones, and some fresh-water shells. These bones were all in a circumscribed area. A jawbone containing teeth had been forwarded to London to be examined by competent palæontologists and osteologists. Underneath the bones the clay was found to be burned. Mr. Skertchly's explanation is, that we have here preserved the one solitary instance in the whole world of a camping ground of palæolithic men, and this camping ground occurred below the boulder clay which belonged to the earliest part of the glacial period. These remains were thus far older than anything previously discovered. Tracing the boulder clay and the beds beneath across the country, he saw that the implements found at Botany Bay were of the same age. The men who lived before the boulder clay age appeared to him to be more intimately connected in time with the men of the palæolithic gravels lying upon the boulder clay, than were the latter with the men of the neolithic age, who scooped out those ancient flint mines near Brandon, called Grimes' graves. These pre-boulder clay implements were, in fact, older than anything of the kind yet seen.

FLINT IMPLEMENTS.

To the Editor of the Standard.

SIR,—To-day's *Standard* contains an account of three rough flint implements found under boulder clay near Brandon, and the

inference is drawn by Mr. Skertchly that "we have here preserved the one solitary instance in the whole world of a camping ground of palæolithic men." At the Queen Street Railway Station, Exeter, this morning, I picked up, in a few minutes' search, from the chert gravel which forms the ballast of the railway, two rough implements of palæolithic type, and as the train pulled up at the various stations on the main line to London, I observed similar forms among the ballast, and generally the whole of the gravel was roughly chipped in the same manner as the so called implements. This gravel is obtained from a pit a few miles east of Axminster, and appears to have been used to form the bed of the railway from Exeter to Basingstoke. I have inspected the pit, and find that these "palæolithic" forms abound *in situ* in the gravel. And if such roughly-fractured stones are implements made by human hands, then we may infer that the South-Western Railway is ballasted with flint implements over a distance of at least 150 miles. And as this gravel undoubtedly belongs to the "drift" period, for it coats the hills from base to summit, then the discovery of the three implements at Brandon is thrown into the shade by the mass of evidence in the south-west of England to pre-glacial man. The real question, however, is, are these roughly-broken pieces of flint and chert human tools? It has been said that the "36 flint implements exhumed from Brixham Cavern revolutionised the public opinion of Western Europe on the high antiquity of man." These flints may now be seen in the Christy Museum, Victoria Street. I will undertake to pick up, within one hour, thirty-six pieces of chert from the ballast of the South-Western Railway, more worthy, from a palæolithic point of view, to be called implements than these pieces of rubble flint from Brixham Cavern, which have so often been referred to as furnishing conclusive evidence of the high antiquity of man.

N. WHITLEY, Hon. Sec. of the Royal
London, Oct. 12. Institution of Cornwall.

To the Editor of the Standard.

SIR,—I have been staying in the neighbourhood of Seaton, in Devonshire, for several weeks, and have carefully searched the

district for implements of neolithic type, which are of frequent occurrence and may be readily found in the shape of "worked" flints on the surface of the ploughed fields in the neighbourhood of Beer. Mr. P. O. Hutchinson, of Sidmouth, has also in his district found precisely similar forms. I have also directed attention to the possible occurrence of "palæolithic" implements in the drift of the district, having not only visited the "pit" (at Broom, between Axminster Station and Chard Junction), which is alluded to by Mr. Whitley in your paper of Tuesday, 17th, but having also searched other drift sections in the district, as well as making inquiries of the workmen. I beg to assure your readers that I have not met with a single implement in the drift, nor can I ascertain that any have been found. The workmen at Broom are well acquainted with their nature, having seen those exhibited in the Blackmore Museum at Salisbury. I have little doubt that the specimens Mr. Whitley has seen are pieces of chert exhibiting a natural fracture which to an unpractised eye might be mistaken for artificial. Mr. Whitley, though a sceptic, appears easily imposed upon by pieces of chert, which I have no doubt he will be quite ready to submit to competent judges. I do not see how his letter in any way throws discredit on the discovery at Brandon.—

I remain, yours faithfully, S. G. PERCEVAL.

Beer, near Axminster, Oct. 19.

To the Editor of the Standard.

SIR,—Indulge me with the favour of a reply to the letter of Mr. Perceval, inserted in the *Standard* of the 19th inst., on the so called palæolithic implements of flint and chert from the drift. The subject is contemptible in its material surroundings, but the issues are tremendous. We are informed by Mr. Perceval that in the neighbourhood of Axminster implements of a neolithic type are of frequent occurrence on the surface, but that in the drift beds he has found none of palæolithic type, and he infers that none have been found. On this latter point I differ from him, and affirm that one of the two "implements" which I picked up out of the ballast at the Exeter Station is of the true palæolithic form of the Somme Valley "tools." And having visited this

valley on three occasions to inspect the sections of the beds and the implements, and having also carefully examined the many specimens of these implements in the museum of M. Boucher de Perthes, at Abbeville, I may venture with some confidence to put the positive fact of my finding of this "implement" against the negative evidence of the research of Mr. Perceval. The other "implement" was a large unpolished lance head flake, far superior to many of the same class found in Brixham or Kent's caverns, and which are said to be palæolithic. The supposition that I, being a palæolithic "sceptic," have been deceived by an unpractised eye is a clear case of begging the question; in syllogistic form it means all unbelievers have the unpractised eye. Those who have the unpractised eye are not qualified to judge in this matter: therefore, the opinion of palæolithic unbelievers is not to be received. An argument which is unanswerable if only the major premisses were true.

Sensational announcements of fresh geological discoveries in proof of the high antiquity of man appear at somewhat regular intervals; but the facts on which they rest have seldom been tested. It would involve an amount of labour, time, and expense, which few persons would readily undertake, and thus they pass into the category of established facts, and are assumed to be unanswerable. Thus, in 1859, the discoveries in Brixham cavern were said to be confirmed by the most experienced antiquaries; then followed the adoption of the opinions of Boucher de Perthes, that the fractured flints of the Somme were human implements, and the noisy "congress" on the Abbeville human jaw. Mr. Frank Calvert was said to have found the work of man in the miocene deposits. A human tibia, first described as the bone of an elephant, was said to have been found under glacial clay at the Settle Caves, and now we have the three rough implements under boulder clay near Brandon. And yet, notwithstanding the errors and conflicting opinions of scientific men, the inconclusive evidence on this subject is constantly urged on the acceptance of the uninformed. Lyell tells us that palæolithic man was post-glacial; Geikie that he was inter-glacial; and Belt that he was pre-glacial. The interpretation of the facts are not only contradictory, but the facts themselves, at least in the case of the "famous" Brixham

cavern, completely break down under a searching examination. I have thoroughly explored and mapped this cavern, and surveyed the surface deposits on the adjoining land. Shortly, this noted case is as follows:—The “36 flint implements of undoubted human workmanship” have been kept in private custody for the first fourteen years after their discovery, and have only lately been placed for inspection in the Christy Museum. It is now found that about one-third of these “famous implements” are pieces of rubble flint, undistinguishable in form from what may be picked up on a flinted path, and in size no larger than the top of a finger—that others are shattered undefinable pieces of flint and broken pebbles—and that a few are rough subsoil flakes, which are found by thousands in the soil at places in Devon and Cornwall. Further, that the symmetrical scraper, fig. 412 in “Ancient Stone Implements,” said to be found in the cavern, was not found there, but in the soil without the cavern—that the “charcoal band” contains no charcoal—that the rod of ivory, which we were left to infer might have been the sceptre of a palæolithic prince, was not found by the committee of exploration, is not now with the relics in the museum, and that its origin is unknown—that the plaster casts of a neolithic flint knife, and of a modern Celt, sold to visitors in the cave as models of the implements found in the cavern, are gross deceptions—and that the “most famous specimen” from the cave, that of the “entire hind leg of a cave bear,” to which such prominence was given in the first edition of the “Antiquity of Man,” has been found to be surrounded with such a mass of misstatements, capped by the fact that it is not the remains of the extinct bear, but of its modern relative, that it has been quietly dropped in the third edition of that work; and, instead of the former inference, that man in Devon preceded the cave bear, we have now the more moderate conclusion that man in this district preceded the reindeer.

If Mr. Perceval will give the same amount of labour and time which I have bestowed on these palæolithic scares, he will find what appears to the “practised eye” to be a rough human implement passes by such insensible gradations into other forms of fractured flint obviously clipped by natural causes, that the assumed evidence of design becomes obscured and obliterated.

No better proof of this can be found than in a closed drawer at the Jermyn Street Museum, where an officer of the Government geological survey has arranged a series of specimens to illustrate this progression; and a reference to these flints in the "Geological Repertory" will show that the trained eye of this accomplished geologist fails to detect the line of demarcation between what is supposed to be the worked implement and the naturally chipped flint.

I am away from my books of reference, but I will answer for the substantial accuracy of the statements in this letter.—I am, Sir, your obedient servant,

N. WHITLEY, Hon. Sec. of the Royal
Institution of Cornwall.

Manor Office, Eastbourne, Oct. 26.

Mr. Whitley's paper, entitled "The Palæolithic Age Examined," in the Transactions of the Victoria Institute, is a masterly discussion of this question by a practical man, and therefore deserves serious reading. His arguments upon the facts appear in good part unanswerable, and show upon what imperfect data the conclusions in the past as to the so-called palæolithic age have been founded.

APPENDIX F.

DEGRADATION OF RACES.

IN his "Ancient History of the East," vol. 1, p. 56, François Lenormant has the following remark on "Degradation of Races": "Some anthropologists have wished to seek the type of primitive man among the Hottentots or Aborigines of Australia; but such an opinion is not scientifically admissible; these tribes show in their physical characteristics *such a state of degradation as to prove that they were once in a more elevated condition, from which they have gradually declined.*" (See p. 196, *ante.*)

APPENDIX G.

ON THE ASSERTED OCCURRENCE OF HUMAN BONES IN THE ANCIENT
FLUVIATILE DEPOSITS OF THE NILE AND GANGES.

IN a paper with the title as above, read by the late Dr. Falconer, F.R.S., to the Geological Society of London, March 22, 1865, the following passages occur :—

3. *Asserted Discovery of Human Bones.*—The next case of Nilotic fossil remains is of still higher interest, being the asserted discovery of human bones in one of the conglomerate or older beds of the Nile-valley alluvia, at a time when the antiquity of the human race did not engage the attention of men of science as it does at the present day. In Leonhard and Bronn's 'Jahrbuch' for 1838 a series of letters appeared, in which Russegger gave some account of the result of his explorations then in progress in Nubia and Sudan. In one of these letters, dated Sennaar, 23rd March, 1838, he describes the structure of the alluvial banks of the Blue Nile from Khartoom up to Sennaar, and thence to Roserres, and adds that, "In the alluvia of the Blue Nile at Duntai we found human bones. The structure of these bones was perfectly preserved, but the animal matter had disappeared. Their surface was polished and of a blackish-brown colour; the substance very hard, but not yet petrified"* (Jahrbuch, 1838, p. 403). In the second volume of his travels, published in 1843, Russegger enters at greater length into the details of the case, and states that the alluvial formation of the Blue Nile, from Khartoom to Sennaar, consists of freshwater beds thrown down by the river itself, and that, regarded as a whole, they are divisible as follows, from above downwards :—

1. Ordinary fluviatile mud, the result of modern periodical inundation, analogous in its external characters to the Nile-mud of Egypt, and containing imbedded nodules of calcareo-argillaceous concretion (nodular kankar?).

* "In den Alluvionen, des blauen Flusses bei Dundai fanden wir Menschenknochen. Das Gefüge, der Knochen, war vollständig erhalten, der Thiermaterie aber zerstört. Die Aussenfläche war glänzend und schwarz-braun gefärbt. Die Masse sehr hart, aber noch nicht versteinert."

2. Friable, fine and coarse conglomerate composed of quartz-grains and pebbles, cemented by ancient mud, forming a kind of sandstone-grit, and yielding calcareous and marly concretions.

3. Ancient Nile mud, indurated, and containing imbedded iron-shot clay, siliceous limestone, &c., full of calcareous and marly concretions in the ferruginous portions.

4. Fine and coarse quartzose conglomerate, with the materials united by ancient Nile-mud and calcareo-argillaceous cement, very hard, used as a building-stone, and containing imbedded masses of saline clay and of ordinary clay and marl, full of clay-ironstone, ferruginous sandstone, and of calcareous and marly concretions.

5. Freshwater limestone (travertine or slab kankar?) of a dark-grey colour, hard and sonorous, occasionally having a marly appearance, with here and there a tendency to a concentric and generally crystalline structure.

The beds are described as horizontal, and of variable thickness, attaining sometimes, as in Nos. 1, 2, and 3, as much as five or six fathoms (Jahrbuch, 1838, p. 408). According to Russegger, with the exception of the uppermost deposit, they contain, very generally, fossil vegetable remains, chiefly the wood of *Mimosas* (*Mimosa Nilotica*) and stems of *Asclepia Calotropis procera*: the former are either converted into lignite or have their core exhibiting a concentrically disposed and radiating crystalline structure, derived from the imbedding matrix; the latter have the bark preserved, but the spongy core occupied either by calcareous matter or conglomerate. These alluvia presented very commonly shells of the Mollusca now living in the waters of the Nile, both bivalves and univalves, together with some land species. Among the most common was *Atheria Caillaudi*, occurring frequently in heaps or oyster-banks, together with species of *Unio*, *Iridina*, and *Anodonta*. In the alluvium of Sennaar he found *Ampullaria ovata* and a species of *Helix*. He adds that *Atheria Caillaudi* was also abundant in the deposits of the White Nile.

There are eight conclusions which Dr. Falconer draws, but the only one concerning us is No. 7, which runs as follows: "No trustworthy cases of the occurrence of very ancient human bones, or industrial objects, have yet been established from the sections of the Jumna and Ganges."

APPENDIX H.

CAVE LIFE IN SCOTLAND.

THE following extract from the *Scotsman* of February 10, 1877, is a useful parallel to some of the arguments contained in the preceding pages:—

Dr. Arthur Mitchell delivered last night, in Queen Street Hall, Edinburgh, to the Members of the Philosophical Institution, a lecture on cave life in Scotland. He described visits paid to the caves in Wick Bay, which are at the present day occupied by tinkers, whose mode of life and habits he sketched. A study of this cave life led him to the following conclusions:—(1) That because a certain portion of a people live in caves, it does not follow that the whole or even a large part of that people do so; (2) that the cave-dwellers of a nation may exhibit a degree of degradation which may not be exhibited by the people of whom they form a part—in other words, that cave-dwelling in a country may represent something quite abnormal and exceptional as regards that country and its people, and if that be true in this age, it may have been true in any age; and (3) *that working in metals does not necessarily indicate greater mental power than working in stone.* Next he referred to the grave and monumental cairns of Scotland, and in conclusion discussed the classification of antiquities into stone, bronze, and iron ages. This classification, he maintained, had no definite or chronological significance; and it failed equally to indicate stages of civilisation, in the sense of invariable gradations of progress towards existing civilisation, necessarily consecutive and universally applicable to all varieties of the human family. The three periods, he further contended, although they might present themselves in countries close to each other, need not synchronise; and hence the antiquities of each country must be separately studied with reference to the evidences of such a classification of stone, bronze, and iron ages.

APPENDIX. I.

EARLY INTERCOURSE BETWEEN EGYPT AND CHINA.

WE have, in Chapter VI., drawn attention to the fact of an identical process for making Steel being practised both in Greece and China at the same time, and that this process has been described in the writings of the foremost philosophers of both countries,—by Aristotle in the former, and by Leih-tze in the latter. These philosophers were contemporaries.

We have also, whilst ignorant of there having been any communication between Greece or Egypt and China in these remote ages, pointed out that this is an occurrence naturally resulting from the outspreading of the human race into nations, each section of which carried with it more or less of that stock of knowledge and practical skill which was common to the entire human race before the grand crisis of separation into different nations took place. At the last moment, then, we have fallen in with a remarkable paper* by the late Dr. Inman, which contains notice of some singularly convincing evidence, showing at least that, in the early days of Egypt's supremacy, there was intercourse between that country and China; and since, as it is proven that the Greeks derived most of their learning from the Egyptians, we perceive how the art of making Steel may either have been obtained by the Aryan Greeks from the Allophyllian Chinese, through the Semitic Egyptians, or *vice versa*. The evidence to which Dr. Inman alludes is contained in the following extract from his paper:—

“We may shortly sum up the archæological evidence of very ancient commerce thus:—Fortune has found, in Chinese curiosity shops, porcelain and other forms of Egyptian art, whose extreme age is not doubted by scholars. *In like manner, Chinese curiosities have been found in the tombs of notables buried by the banks of the Nile.* Still farther, small cubical seals of white China, each

* “History of the English Alphabet.” By Thomas Inman, M.D. A Paper read before the Liverpool Literary and Philosophical Society, Nov., 1870. London: Trübner & Co. 1872.

face covered with inscriptions in very ancient Chinese characters, were found, eighteen feet below the surface of the ground, by workmen who were digging the foundations of Kilmainham Gaol, Dublin. Nor must we pass by the apparent evidence of the antiquity of trade which is given in Genesis xxxvii. 25, 28, in which we are told that certain Ishmaelites, or Midianites, were passing through Palestine as merchants, with a convoy of desert ships, or camels, to Egypt. We will not dwell upon the nature of the cargo, further than to assert that, whatever it was, the materials did not exist in Egypt, and were brought thereto from a distance."

LIST OF WORKS REFERRED TO IN THIS VOLUME.

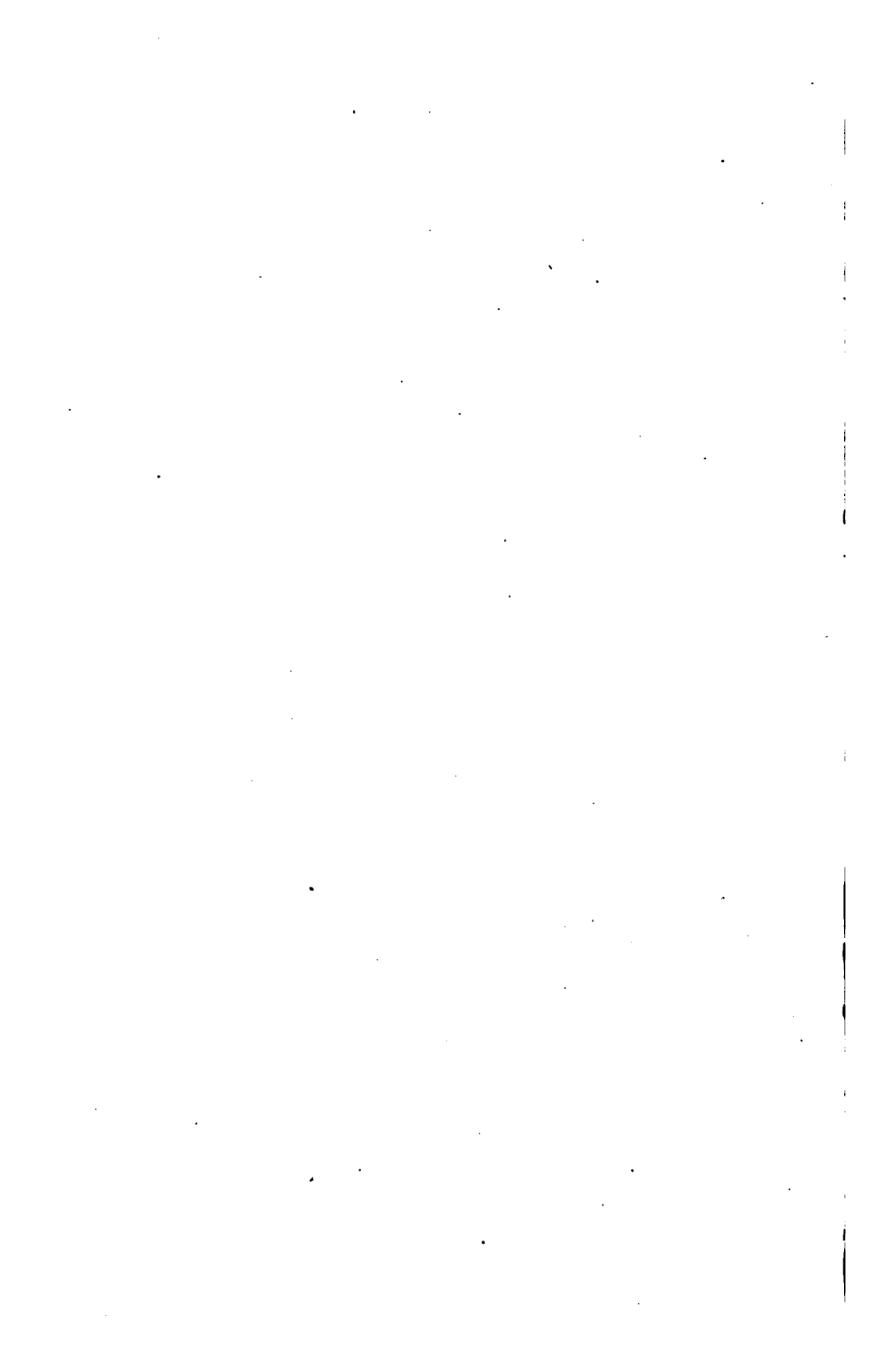
- (1.) The Geological Evidences of the Antiquity of Man, etc. By Sir Charles Lyell, Bart., F.R.S., etc. A.D. 1863.
- (2.) The Origin of Laws, Arts, and Sciences, and their progress among the most Ancient Nations. By M. De Goguet. A.D. 1761.
- (3.) The Primitive Inhabitants of Scandinavia. An Essay on Comparative Ethnography, and a contribution to the History of the Development of Mankind, etc., etc. By Sven Nillsson. Translated by Sir John Lubbock.
- (4.) Denmark in the Early Iron Age. By Conrad Englehardt, late Director of Museum of Northern Antiquities at Flensburg. A.D. 1866.
- (5.) Troy and its Remains. By Dr. Henry Schliemann. A.D. 1875.
- (6.) Metallurgy. Iron and Steel. By John Percy, F.R.S., etc. A.D. 1864.
- (7.) Narration of the Operations and recent Discoveries within the Pyramids, Temples, Tombs, and Excavations in Egypt and Nubia, &c. By G. Belzoni. A.D. 1821.
- (8.) Lectures on the Science of Language. By F. Max Müller. A.D. 1873.
- (9.) Chips from a German Workshop. By F. Max Müller. A.D. 1868.
- (10.) Families of Speech. By the Rev. F. W. Farrar, D.D., F.R.S., etc. A.D. 1873.
- (11.) History of Etruria. By Mrs. Hamilton Grey.
- (12.) Bulletin de la Société Vaudoise des Sciences Naturelles. Tome VI. Memoir by M. Morlot.
- (13.) Mineralogy. By John Philips. A.D. 1864.
- (14.) Ure's Dictionary of Arts, Manufactures, and Mines. A.D. 1863.
- (15.) Nicol's Elements of Mineralogy. A.D. 1873.
- (16.) Our Inheritance in the Great Pyramid. By C. Piazzi Smyth, Astronomer-Royal for Scotland. A.D. 1874.
- (17.) Juventus Mundi. By the Rt. Hon. W. E. Gladstone, M.P., etc. A.D. 1869.
- (18.) Contemporary Review. Art. Metals in Homer. By the Rt. Hon. W. E. Gladstone, M.P., etc. A.D. 1874.
- (19.) Homer's Iliad, and Translations by Lord Derby, Chapman, Brandreth, and Pope.
- (20.) Letters from Egypt. By C. R. Lepsius. A.D. 1843.
- (21.) Proceedings of the Philosophical Society of Glasgow. A.D. 1871 to 1875.
- (22.) The Pyramids of Gizeh. By Col. Howard Vyse. A.D. 1840.
- (23.) Philosophical Transactions of the Royal Society.
- (24.) Ancient Workers and Artificers in Metal. By James Napier, F.C.S., etc. A.D. 1856.
- (25.) The Manners and Customs of the Ancient Egyptians. By Sir Gardner Wilkinson. A.D. 1856.

- (26.) Hesiod. *Opera et Dies*.
- (27.) Transactions of the Devonshire Association for the Advancement of Science, etc. Paper entitled "The Antiquity and the Use of Metals, and especially Iron, among the Egyptians." By the Rev. Basil H. Cooper. A.D. 1868.
- (28.) Egypt's Place in Universal History. By the Chevalier Bunsen. A.D. 1859.
- (29.) The Book of Jeremiah.
- (30.) The Book of Job.
- (31.) Herodotus. *Euterpe*.
- (32.) Primitive Culture. By E. B. Tylor. A.D. 1871.
- (33.) The Evening Post (Brazilian).
- (34.) Die Metalle in den Egyptischen Inschriften. Von C. R. Lepsius aus den Abhandlungen der Königl. Akademie der Wissenschaften. A.D. 1871.
- (35.) Champollion Monuments, etc.
- (36.) Travels in Ethiopia. By Hoskins.
- (37.) Denkmäler der Preussischen Expedition. Von. C. R. Lepsius.
- (38.) Rossellini Monuments. Civ.
- (39.) Harris Papyrus.
- (40.) Ramblings to the Turquoise Mines and the Sinaitic Peninsula. Macdonald. A.D. 1866.
- (41.) Proceedings of the Society of Antiquaries. Vol. V. A.D. 1873.
- (42.) La Terre. By M. Pozzy. A.D. 1875.
- (43.) Voyage en Palestine. By M. De Saulcy.
- (44.) Birth of Chemistry. By Rodwell. A.D. 1874.
- (45.) Transactions of the Society of Biblical Archæology. A.D. 1872.
- (46.) Assyrian Discoveries. By George Smith. A.D. 1875.
- (47.) Five Great Monarchies of the Ancient Eastern World. By the Rev. George Rawlinson. A.D. 1871.
- (48.) Nineveh and its Remains. By Layard. A.D. 1854.
- (49.) Inaugural Address. By Dr. Birch, to the London Congress of Orientalists. A.D. 1874.
- (50.) Avesta. The Religious Books of the Parsees. By Spiegel and Bleek. A.D. 1864.
- (51.) Seven Homilies on Ethnic Inspiration. By the Rev. Joseph Taylor Goodsir. A.D. 1871.
- (52.) The Speakers' Commentary. A.D. 1871, *et seq.*
- (53.) Inaugural Address to the British Association at Bristol. Sir John Hawkshaw. A.D. 1875.
- (54.) Genesis and part of Exodus. By Dean Alford. A.D. 1872.
- (55.) Sanchoniathon.
- (56.) Aristotle. The Meteorologies.
- (57.) De Re Metallica. Quibus officia Instrumenta, Machinæ, ac omnia Denique ad Metallicam Spectantia, non modo Luculentissimè describuntur; sed, et per effigies suis locis insertas, adjunctis Latinis, Germanicisq; appellationibus, ita ob oculos ponuntur, ut clarius tradi non possint. Georgii Agricolæ Kempnicensis, Medici ac Philosophi Clariss. A.D. 1621.

- (58.) Private Diary of the Duke of Buckingham.
- (59.) Pliny. Hist. Nat. XXX. 14.
- (60.) The Engineer. Vol. XXXII.
- (61.) Archæological Survey Report to the Government of India. A.D. 1861-62.
- (62.) Essay on Indian Antiquities. Prinsep. A.D. 1868.
- (63.) Voyages d'Ibn Bathoutah. A.D. 1855.
- (64.) History of Architecture. By James Fergusson. A.D. 1867.
- (65.) Architecture of Ancient Delhi, especially the Buildings around the Kutb Minar. By Henry Hardy Cole, R.E. London Arundel Society. A.D. 1872.
- (66.) Journal of the Iron and Steel Institute. Vols. 1 and 2.
- (67.) Journal of the Asiatic Society of Bengal. Vol. XXXIII.
- (68.) Les Monuments d'Architecture de Delhi. Journ. Asiatique. A.D. 1860.
- (69.) Sanskrit-English Dictionary. By Professor Monier Williams. A.D. 1872.
- (70.) Asiatic Researches. By Sir William Jones. A.D. 1807.
- (71.) Bacon's "Studies in Hindostan."
- (72.) Forrest, Jumna and Ganges.
- (73.) La Science des Religions. Emile Burnouf.
- (74.) Travels Retravelled. By Lady Barker. A.D. 1872.
- (75.) The "Malay Archipelago." By Alfred Russel Wallace. A.D. 1867.
- (76.) Illustrations of Ancient Architecture in Hindostan. By James Fergusson. A.D. 1868.
- (77.) Memoirs of the Literary and Philosophical Society of Manchester. A.D. 1873.
- (78.) Les Mondes. A.D. 1871. Tome XXVI.
- (79.) Phillip's Metallurgy. A.D. 1874.
- (80.) Chaldean Account of Genesis. By George Smith. A.D. 1876.
- (81.) Chinese Classics. Vol. III. By Legge. A.D. 1865.
- (82.) Kanghi-tsi-tien. Kanghi's Dictionary (Chinese). A.D. 1710.
- (83.) The "Pi-tan," or "Pencil Talk." A Work of the Ming Dynasty.
- (84.) The "Pent Saow." A Work of the Ming Dynasty.
- (85.) Homeric Synchronism: an Inquiry into the Time and Place of Homer. By the Rt. Hon. W. E. Gladstone, M.P., etc. A.D. 1876.
- (86.) Anacalypsis. By Godfrey Higgins. New ed. A.D. 1874.
- (87.) Ancient History of the East. By François Lenormant. A.D. 1869.
- (88.) Elements of Geology. By Sir Chas. Lyell, Bart., F.R.S., etc. A.D. 1868.
- (89.) Cave Hunting. By Professor Boyd Dawkins. A.D. 1874.
- (90.) Rivers, Mountains, and Sea Coast of Yorkshire. By Professor Phillips. A.D. 1855.
- (91.) Kent's Cavern : Its Testimony to the Antiquity of Man. By Wm. Pengelly, F.R.S. A.D. 1876.
- (92.) Climate and Time in their Geological Relations. A Theory of Secular Changes of the Earth's Climate. By James Croll, F.R.S., etc. A.D. 1875.

- (93.) *Anthropological Review.* A.D. 1868.
- (94.) *Transactions Chicago Academy of Science.*
- (95.) *Geology for General Readers.* By David Page, F.G.S. A.D. 1866.
- (96.) *True Age of the World.* By Professor Wallace. London, A.D. 1844.
- (97.) *Facts and Dates.* By Rev. Alexander Mackay, LL.D. A.D. 1869.
- (98.) *The "Times" Newspaper.* March, A.D. 1876.
- (99.) *"Nature."* September, A.D. 1875.
- (100.) *"Iron."* December 18, A.D. 1875. Article by W. Mattieu Williams.
- (101.) *Osethic Grammar.* By Sjögren.
- (102.) *Asiatic Researches.* By Sir William Jones. Vol. IV. 1807.
- (103.) *Holwell's Mythological and Etymological Dictionary, &c.,* 1793.
- (104.) *The Book of Psalms.*
- (105.) *History of Creation.* By Ernst Haeckel. A.D. 1876.
- (106.) *Philosophical Transactions of the Royal Society of London.* Vol. CXLV.
- (107.) *Quarterly Journal Geological Society of London.* A.D. 1865.
- (108.) *The Mining Register,* published at Salt Lake City. A.D. 1874.
- (109.) *Intellectual Development of Europe.* By Draper. A.D. 1864.
- (110.) *Introduction to the Science of Religion.* By Max Müller. A.D. 1873.
- (111.) *Ancient Symbol Worship: Influence of the Phallic Idea on the Religions of Antiquity.* A.D. 1875.
- (112.) *On the Causes of the Original Dispersion of Primitive Nations in times of Remote Antiquity.* By ΠΡΟΤΕΤΣ. A.D. 1840.
- (113.) *The Antiquities of Israel.* By Heinrich Ewald. A.D. 1876.
- (114.) *Burckhardt's Travels in Arabia.*
- (115.) *Adventures of Colonel Somerset in Caffraria.* A.D. 1868.
- (116.) *"Ancient Faiths Embodied in Ancient Names."* By Thomas Inman, M.D. A.D. 1874.
- (117.) *Transactions International Congress of Anthropologists.* A.D. 1867.
- (118.) *The "Standard" Newspaper.* October, A.D. 1876.
- (119.) *The "Scotsman" Newspaper.* February, A.D. 1877.
- (120.) *History of the English Alphabet.* By Thomas Inman, M.D. A.D. 1872.
- (121.) *The Palaeolithic Age Examined.* By N. Whitley, C.E. A.D. 1874.

LANGUAGE.		CHARACTERS.	PHONETIC VALUE.	ENGLISH EQUIVALENT.	OLDEST KNOWN DATE OF.
NAME	FAMILY				
		— 鐵官	...	{ Ironmasters.	
Sanskrit.		अट्ट अयर	Ara. Ayas.	Iron. Iron.	Oldest Sanskrit. — Probably B.C. 1,500.
Greek.	Aryan.	χάλυψ σίδηρος κίανος ἀδάμας αἰησ	Kalups. Sideros. Kuanos. Adamas. Ares.	Steel. Iron. { Blue Coloured Metal, probably Tempered Steel. Steel. Iron.	Homeric Age. — Hesiod. —



INDEX.

ACHILLES.

CHALDEE.

A

- Achilles*, the shield of, 134.
Agencies, physical influence of, 206.
Agricola, steel process of, 135.
Ahmed, *Syud* on the Delhi Lâht, 151.
Akkadian and Sumirian races and Iron, 104.
Alphabets, Aryan, which the oldest of, 122.
Altaville, skull of, 208.
Amakosas, the, 55, 56.
Amapondas, the, 55, 56.
Analysis of Egyptian word for iron, 41.
Ancient Egyptian word for Iron, 41.
Anorthite and Augite, 234.
Ara, Monier Williams on the word, 225.
Arab cunning, 34, 35.
Arcelin, M., and Egyptian flints, 89.
Archaic Iron-working in Egypt, 51.
Ardeshir and the Zend Avesta, 123.
Aristotle, his account of Greek steel process, 36, 135.
Aryan alphabets, which of, the oldest, 122.
 ——— verb *ar*, the, 221.
Aryans, Primitive, 223.
Ayân Mûsa, 80.
Assegais, the, 55.
Assur-nazir-pal, has-reliefs of, 106.
Assyriologists, 46.
Assyrian iron, 107.
 ——— steel tools, 113.
 ——— testimony, 112.
Augite and *Anorthite*, 234.
Avesta, *Zend*, oldest texts of, 123.
Axes, American iron, 217.

B

- "*Ba*," probable value of, 67.
Babylonian records, 102, 103.
 ——— gems, 104.
 ——— civilisation, 104.
Baumhauer on iron in hailstones, 226.

- Bell*, I. *Louthian*, on stone, bronze, and iron theory, 231.
Belzoni's discovery of iron in Egypt, 13.
Biblical chronology, 211.
Birch, Dr., on Egyptian hieroglyphics for iron, 67.
 "Bones of Typhon," 74.
 ——— human, alleged, in the Nile and Ganges, 263.
Brandon Celts, 257.
Brandreth, Homeric researches, 24.
Breccias, 193.
 ——— Sir Charles Lyell upon, 194.
 ——— Pengelly, Mr. upon, 194.
Breslau, Professor, on the character of Hebrew, 121.
British Museum, Greek iron-work at, 136.
Brugsch on hieroglyphics, 70.
Bruniquel, cave of, stalagmite, 202.
Buckingham, Duke of, on Syracuse, 138.
Buildings in Egypt, 94.
Bullets, sling, from Troy, of iron, 9, 11.
Bunsen, Chevalier, and Wm. Osburn compared, 47.
Burnouf, Emil, on the Suastika, 160.

C

- Cain*, *Tubal*, 215.
Cartouches of Shofa and Nu-Shofa, 89.
Catalan furnaces in Sinaitic Peninsula, 81.
Cave deposits, 195.
 ——— life in Scotland, 265.
Cavern, Kent's, 193.
Cape Colony, native method of iron-making, 55.
Caution of an orient sage, 50.
Cesmola, General, his researches, 188.
Chabas on hieroglyphics, 70.
Champollion on hieroglyphics, 70.
Chalybdic steel, 137.
Chaldeans, metallurgy of, 105.
Chaldee and Hebrew words for iron, 67.

Chaldean iron, 106.
Chalybes, the, 220.
Charcoal and cinders in Kjökkenmodding, 2, 7.
Chapman, Homeric researches, 24.
Chesbet, meaning of, 71.
Chevalier Bunsen and Wm. Osburn compared, 47.
China, antiquity of iron manufacture in, 179.
 — Mr. Henderson on iron manufacture in, 251.
Chinese evidence, 179.
 — and Greek steel processes alike, 184.
 — steel, 36.
 — steel process, ancient, 183.
 — words for iron and steel, 180.
Chronology, Biblical, 211.
Civilisation, high state of, in ancient Egypt, 48.
 — Babylonian, 104.
Clyde, the River, Roman pavement under, 208.
Coliseum, the, iron cramps of, 141.
Colonists, early, of Egypt, whence from, 92.
Conclusion, 227.
Cooper, Rev. Basil, his evidence, 41.
 — and Mr. Pengelly, 52.
Cootub, meaning of, 160.
Coptic, what linguistic family of, 17.
Cunning, Arab, 34.
Cunningham, General, on Iron Lâht at Delhi, 146.
Cuneiform inscriptions, their testimony, 118.
Cybele, Mother, 133.

D

Daimachus on Greek steel, 137.
Damascene steel, 144.
Daktyls, the Idæan, 132, 133.
Date of Phœnician inscriptions in Brazil, 63.
Dawkins, Prof. Boyd, on stalagmites, 199, 201.
Degradation of races, 196, 262.
Deluge, Noahitic, 29.
Denmark, unimportance of the researches in, 8.
Deposits, cave, 195.
De Rougé on hieroglyphics, 70.
Development, progressive nature of, 1.
 — theory reborn, 6.
Derby, Lord, Homeric researches, 24.

Dhava, Rajah, era of, 151.
Discoveries of Schliemann at Ilion, 8, 9.
Dummichen on hieroglyphics, 70.

E

Earliest substance used, iron, 3.
Edkins, Dr., on iron in China, 181.
Egypt, archaic iron-working in, 51.
 — a riddle to evolution, 45.
 — high state of early civilisation of, 48.
Egyptian ancient languages, what family of, 17.
 — hieroglyphics for "Iron," 66.
 — language infused with Semitic, 17, 18.
 — Tools, 92.
 — word for iron, ancient, 41.
 — word for iron, analysis of, 41.
Elba, steel process at, 135.
Error of those who have pronounced judgment in regard to appearance of iron, 12.
Evolution, Egypt a riddle to, 45.
Eukrite, 234.
Ewald cited as to ancient oaths, 249.

F

Farrar's, Rev. Dr., testimony as to Coptic and Egyptian languages, 17.
Farrar, Dr., on the Phœnicians, 59.
Flight, Dr., analysis of iron from Great Pyramid, 100.
Flint implements, Proto-Egyptian, 83.
 — Brandon, 257.
 — Mr. Whitley upon, 257, 262.
 — Mr. Perceval upon, 258.
Flints and iron coeval, 85.
 — Mr. Whitley on, 256, 7, 8, 9.
 — Theban, Mr. Ouvry on, 88.
Forbes, David, on Lâht of Delhi, 148.
Fusion unnecessary to produce iron, 37.

G

Gabbro, 236.
Galgala, flint implements from, 84.
Galton, Francis, Sinaitic slag, 65.
Gargaron, Kotulos and Akmon, symbolism of, 133.
Geologists, the, 189.
 — the, and the priesthood, 214.
Geological time, 203-205.
 — estimates, value of, 213.

Gizeh, artists of, 49.
Geo. Smith's Assyrian "finds," 115.
Germanicus and Theban priests, 69.
Gladstone's, Mr., Homeric researches, 24.
 ——— recent admissions, 187
 ——— at fault, 26.
Gladstone and *Schliemann*, 27.
Glass-colouring in Proto-Egypt, 68.
Glass-cutting in Proto-Egypt, 68.
Glaucus, the Chian, inlaying of iron, 138.
Goguet, the first propounder of stone, bronze, and iron theory, 5.
Goodsir, Rev. Joseph, on Ethnic inspiration, 123.
Great Pyramid referred to, 18, 29.
 ——— iron from, 98.
 ——— analysed, 100.
Greek poets alluded to, 8.
 ——— steel, 36, 134, 135, 136, 137.
Greenland, iron masses in, 233, 237.
Grimes' graves, 257.
Growth of stalagmite, 198-201.
Guarani, languages, the, 63.

H

Haeckel, Ernst, on evolution, 227.
Hamitic languages, 17, 18.
 ——— and Semitic testimony, 17.
Hammurabi, his conquest, 103.
Hartland, Mr., his discovery of Egyptian iron-works, 65.
Hartland, Mr., discoveries at Surabit-el-Khadur, 80.
Hawkins, Sir John, on present knowledge, 124.
Heath, J. M., on Wootz, 178.
Hebrew, Professor Breslau on the character of, 121.
 ——— testimony, 120, 125, 126, 127, 128.
 ——— and Chaldee words for iron, 67.
Hephaistos, 215.
Hera, Hera, &c., 222.
Herodotus, as to iron in Proto-Egypt, 52.
Herculaneum and *Pompeii*, volcanic deposits over, 208.
Hekekyan Bey's investigations, 34.
Hesiod, as to the age of iron, 39.
Hieroglyphs, Egyptian, for iron, 66.
Hieroglyphic colours for the metal, 75, 77.
 ——— signs, uncertainty of some, 71.

Higgins, Godfrey, *Anacalypsis* quoted, 190.
Hissarlik, *Schliemann's* researches, 8, 82.
Hisingerite, 234.
Homer verified by *Schliemann*, 9.
Homeric researches, *Gladstone's*, 24.
Hoopoe, the symbol of purity, 96.
Howard Vyse, discovery of, 31.
Ilykos invasion, 19.

I

Ida, the peaks of, 133.
Idean Daktyls, the 132, 133.
Ilion, *Schliemann's* researches at, 8, 82.
India, manufacture of large masses of iron in, 237.
Indian iron and steel archaic, 28, 177.
 ——— evidence, 143.
Insidious properties of Iron, 4.
Instruments, iron, from Assyria, 112.
Inversion of strata, 195.
Iron age, early in North-West Europe, 7.
 ——— Assyrian, 107.
 ——— ancient use of, vetoes progressive development, 3.
 ——— filtering out of ferruginous limestone, 55.
 ——— earliest substance used, 3.
 ——— from Great Pyramid not meteoric, 100.
 ——— from Memphis, 31.
 ——— from Great Pyramid mechanically tested, 99.
 ——— certificate as to, 100.
 ——— from Great Pyramid, 98.
 ——— analysed, 100.
 ——— and steel from Wurree Gaon, 177.
 ——— and steel archaic in India, 28, 177.
 ——— in Proto-Egypt, 41.
 ——— in Kjökenmodding impossible, 7.
 ——— Chaldean, 106.
 ——— forging, large masses of, 165.
 ——— insidious properties of, 4.
 ——— inlaying of, attributed to *Glaucus the Chian*, 173.
 ——— Japanese, 172.
 ——— King, the, of Proto-Egypt, 79.
 ——— meteoric, not forgeable, 53.
 ——— malleable, from Great Pyramid, 31.
 ——— ore, simplicity of reduction of, 38.
 ——— properties of, isolate it, 20.
 ——— the, race, 221.
 ——— sickle from Karnak, 13, 14.
 ——— sling bullets from Troy, 9, 11.

Iron universally present, 225, 226.
Iron-works, Egyptian, age of, 86.
Isolation of a race doubtful, 57.

J

Job the prophet, advice of, 50.
Job, book of, referred to, 120.
Jockey cap, stalagmite, the, 199.
 ————— measurements of, 200.
Joshua, tomb of, flint implements
 from, 84.

K

Kafir iron, 55.
Kanaruc, iron beams at, 168.
Kanghi's dictionary, as to steel in
 China, 182.
Karnak, the temple inscriptions, 69.
 ————— iron sickle from, 13, 14.
Kara-indas, his date, 103.
Kent's Cavern, 193.
Kiriri, the, 63.
Kjökkenmodding, 2.

————— testimony incom-
 plete, 7.
Kops, the, 77.
Klein, M., and the Moabite stone, 131.
Krisses, sacred, forging of, 163.

L

Lacedæmonian Steel, 137.
Láht, the, at Delhi, 145.
 ————— forging the, 166.
 ————— non-rusting of, 175.
 ————— of Delhi, recondite significance
 of, 153, 241.
 ————— meaning of the word, 248.
Language, value of as evidence, 192.
Legge, Mr., on Chinese words for
 iron and steel, 180.
Leih-Tze on iron and steel in China,
 36, 181.
Lenormant, François, on pre-historic
 archæology, 191.
Leonard Horner, Mr., his investiga-
 tions, 34.
Lepsius, Dr., on Egyptian hieroglyphs
 for iron, 67.
 ————— testimony of, 29, 40.
 ————— his testimony as to ar-
 chaic iron, 68.
Lister, Mr. Martin, on Greek steel, 134.
Lombeck, forging knives at, 163.
 "Lover of Iron," meaning of phrase,
 79.
Lubbock, Sir John, on flints, 193.

Lydian steel, 137.
Lyell and *Napier* in error, 37.
 ————— *Sir Charles*, as to contents of
Kjökkenmodding, 2.

M

Mafka mines, 71.
Male, the Great, 245.
Malleable iron from the Great Pyra-
 mid, 31.
Mallet, Professor, on meteoric iron, 53
Robt., on iron in India, 143.
Mazid-i-kutb-ud-Islam, the, 145.
Max Müller wrong, 15.
 ————— contradicts himself, 15, 16.
 ————— more at fault, 19.
May-pole, the, 175.
Medinet Habu, the temple of, 75.
Memphis, iron from, 31.
Mentone, the Phœnician inscriptions
 of, 63.
Mesopotamian testimony, 102.
Meteoric Augite, 236.
Meteoric iron not forgeable, 53.
Meteorites and native iron, 22.
Mibampes, king, 78.
 ————— the Rev. B. Cooper's
 remarks on, 78.
Moabite Stone, the, 131.
Mohammed Seyd, his attempts to
 forge meteoric iron, 54.
Monuments, Sanskrit, oldest, 122.
Morlot, M., 14.
Mucus, primeval, 227.
Müller, Max, wrong, 15.
 ————— contradicts himself, 15,
 16.
 ————— supplements the theory
 of North European archæologists,
 14.
Munk, Prof., on the Phœnicians, 59.
Mycenæ, Schliemann's discoveries at,
 216.

N

Napier and *Lyell* in error, 37.
Native iron and meteorites, 22.
Nauckhoff, M., on iron masses in
 Greenland, 234.
Netto, Senor Ladislao on the Phœni-
 cian inscriptions in Brazil, 60.
New Zealand, iron ore, 56.
Nile mud excavations, 34.
Noahitic deluge, 29.
Noeggerath, Professor, his attempts
 to forge a meteorite, 54.
Nordenskjöld on iron in snow, 226.

Nordenskjold on iron masses in Greenland, 234, 237.
Nu-Shofo and *Shofo*, cartouches of, 89.

O

Orientalist congress, 98.
Orient sage, caution of, 50.
Osburn, Wm., Egyptian testimony, 48, 49.
 ——— and Chevalier Bunsen, 47.
Ouvry, Mr., on Theban flints, 88.
Ovifak, eukrite of, 235.

P

Peaks of Ida, 133.
Pent Saou, the, 185.
Pengelly, Mr., and Rev. Basil Cooper, 52.
Percy, Dr., his conclusions against progressive development, 6.
Pearse, Col., Indian iron and steel archaic, 29, 177.
Period, earliest, character of, 3.
 ——— of Semitic infusion into Egyptian language, 18.
Philo of Byblos, on the testimony of Sanchoniathon, 131.
Phœnician evidence, 57.
Phœnicians, their instinct, 58.
Phœnician, a Semitic tongue, 60.
 ——— testimony, 130, 131.
 ——— inscriptions in Brazil, 57.
Physical agencies, influence of, 206.
Piazzi Smyth on Egyptian limestone, 64.
Pi-tan, the, 183.
Pliny, his statements, 138, 139.
Pole, significance of the, 176.
Pompeii, iron used at, 142.
Pope, Homeric researches, 24.
Poets, Greek, their song as to the metallic ages, 8.
Pozzy, M., quoted, 84.
Pramantha, the, and Suastika, 160.
Priam's palace, 9.
Priesthood, the, and the geologists, 214.
Primeval use of iron, general remarks on, 1.
Prinsep, James, on the Delhi Lâht, 150.
Progressive development, 1.
Properties of iron isolate it, 20.
 ——— symbolical, 21.
Proto-Chaldean testimony, 102.
Proto-Egyptian word for iron, 41.
 ——— flint implements, 83.
 ——— tools, 92.
Proto-Egypt's iron king, 79.
Pyramid, Great, referred to, 18, 29.

R

Rajah, Dhava, era of, 151.
Ramses III., his treasures, 68.
Raspberry, the red, passage into Asia, 62.
Rawlinson, Prof. George, on cuneiform symbols for iron, 119.
Rawlinson, Rev. George, quoted, 105.
Records, Babylonian, 103.
Recent admissions of the geologists, 210.
Rekmara, tomb of, 68, 74.
Researches, Homeric, Mr. Gladstone's, 24.
Rhampsinitus, his treasures, 68.
Rhind, discoveries by, 12, 13.
Richard, L'Abbé, on Proto-Egyptian flints, 84.
Rodwell, Mr., on Babylonian gems, 104.
Roman pavement under the Clyde, 208.
Rossellini, on Egyptian art, 69.

S

Sahidic dialect, the oldest, 67.
Sanchoniathon, his Phœnician testimony, 131.
Sandbanks of the Tay, 203.
Sanskrit, oldest monuments inscribed in, 122.
Sapercaky, Visconde de, and Phœnician inscriptions, 59.
Sagquara and Abydos tablets, 79.
Scean Gate, the, 9.
Sebau, age of, 13.
 ——— tomb of, 12.
Sephuris, period of, 90.
Semitic and Hamitic testimony, 17.
Schliemann's testimony opposed to the theory, 9, 11.
Schliemann, Dr., his researches, 8, 82, 216.
Schreibersite, 54.
Shepherd invasion, 18.
Shofo and *Nu-Shofo*, cartouches of, 89.
Sinaitic slag, 65.
Skull, of Altaville, 208.
Shoo-king, the book of, the, 180.
Sling bullets of iron from Troy, 9, 11.
Slag, Sinaitic, 65.
Smyth, Piazzi, on Egyptian limestone, 64.
 ——— on the assegaïs, 55.
Simplicity of reduction of iron ores, 38.
Smith, Geo., Assyrian "finds," 115.
Soris and the Canaanites at Wady Meghara, 95.
Spratt, Lieut., on Iron Lâht at Delhi, 149.

Sources of Assyrian iron, 108.
Stalagmite, growth of, 198-201.
Steel, among earliest substances used, 3, 4.
 — in China, antiquity of, 180.
 — at Troy, Dr. Schliemann on, 83.
 — tools from Assyria, 113.
 — and iron tools in Proto-Egypt, 52.
 — Greek and Chinese, 36.
 — — 134-137.
 — and iron from Wurree Gaon, 177.
Stone, bronze, and iron theory inconsistent, 2.
Stones, precious, imitated in Proto-Egypt, 68.
Strata transported and inverted, 195.
Suastika, the, 160.
Substance earliest used, iron, 3.
Sumirian and Akkadian races used iron, 104.
Suphis and Nu-Suphis at Wady Meghara, 97.
Symbolical properties of iron, 21.
Symbols for iron, cuneiform, 118, 119.
Synopic steel, 137.
Syracuse, the amphitheatre, 138.
Syud Ahmed on the Delhi Lâht, 151.

T

Tacitus and Theban priests, 69.
Taht, meaning of, 71.
Tassy, M. Garcin de, on the Delhi Lâht, 151.
Tay, the river, sandbanks in, 203.
Technites, the, 131.
Teih-mo of the Chinese, his nature, 176.
Telchines, the, 131.
Theban flints, Mr. Ouvry on, 88.
Thomson, Dr. Murray, on Iron Lâht, 149.
Thorpe, Prof., on meteoric iron, 53.
Thutmosis III. list of treasures, 68, 69.
Time, geological, 213-215.
Ti Mohr of the ancient Irish, his nature, 176.
Tin absent at Troy, 10.
Titus, arch of, cramp-holes of, 141.
Toledo, sword manufacture, 140.
Tools, Proto-Egyptian, 92.
Transportation of strata, 195.
Troilite in basalt, 234.

Trojan sling bullets of iron, 9, 11.
 — steel, 83.
Troy, site of, Schliemann's researches at, 8, 82.
Tubal Cain, 131.
Tutankamun, 68.
Twachtre, 215.
Tylor, Mr., his conclusion, 56.
Typhon, Bones of, 74.

U

Uncertainty of certain hieroglyphic signs, 71.
Universal presence of Iron, 226.

V

Vasuki, the king of serpents, 154, 250.
Vimana's, section of, 170.
Virginity, tokens of, 176.
Vulcan, 131.

W

Wady Gherundel, 80.
 — Kemeh, 80.
 — Meghara, 80.
 — the monumental tablets, 65.
 — Mukattab, 80.
Wallace, A. R., on sacred krisses, 163.
Whitley, Mr., on flints, 256.
Widmanstädt's figures, 54.
Wilkinson, Sir Gardner, testimony of, 38.
 — his picture of an Egyptian forge, 87.
Wöhler on Iron in Greenland, 233.
Wootz, 178.
Work, character of the past, of Egyptologists, &c., 46.
Wurree Gaon, iron and steel tools from, 29, 177.

Y

Young, James, on iron at Pompeii, 142.
Yohni, the, and Delhi Lâht, 153, 154.

Z

Zend Avesta, oldest texts of, 123.
 — religion taught by Abraham, 123.

